# SOIL SURVEY

# Indiana County Pennsylvania

OUR SOIL ★ OUR STRENGTH

Issued January 1968

UNITED STATES DEPARTMENT OF AGRICULTURE
Soil Conservation Service
In cooperation with
THE PENNSYLVANIA STATE UNIVERSITY
College of Agriculture and Agricultural Experiment Station
and
THE PENNSYLVANIA DEPARTMENT OF AGRICULTURE
State Soil and Water Conservation Commission

Major fieldwork for this soil survey was done in the period 1935–1961. Soil names and descriptions were approved in 1965. Unless otherwise indicated, statements in this publication refer to conditions in the county in 1961–1965. This survey was made cooperatively by the Soil Conservation Service, the College of Agriculture and Agricultural Experiment Station of Pennsylvania State University, and the Pennsylvania Department of Agriculture, State Soil and Water Conservation Commission; it is part of the technical assistance furnished to the Indiana County Soil and Water Conservation District.

# HOW TO USE THIS SOIL SURVEY

THIS SOIL SURVEY of Indiana County contains information that can be applied in managing farms and woodlands; in selecting sites for roads, ponds, buildings, or other structures; and in appraising the value of tracts of land for agriculture, industry, or recreation.

## Locating Soils

All the soils in Indiana County are shown on the detailed map at the back of this report. This map consists of many sheets that are made from aerial photographs. Each sheet is numbered to correspond with numbers shown on the Index to Map Sheets.

On each sheet of the detailed map, soil areas are outlined and are identified by symbol. All areas marked with the same symbol are the same kind of soil. The soil symbol is inside the area if there is enough room; otherwise, it is outside and a pointer shows where the symbol belongs.

## Finding and Using Information

The "Guide to Mapping Units" can be used to find information in this report. This guide lists all of the soils in the county in alphabetic order by map symbol. It shows the page where each kind of soil is described, and also the page for the capability unit and community development group in which the soil has been placed.

Individual colored maps showing the relative suitability or limitations of soils for many specific purposes can be developed by using the soil map and information in the text. Interpretations not included in the text can be developed by grouping the soils according to their suitability or limitations for a particular use. Translucent material can be used as an overlay on the soil map and colored to show soils that have the same limitation or suitability. For example, soils that have a slight limitation for a given use can be colored green, those with a moderate limitation can be colored yellow, and those with a severe limitation can be colored red.

*Farmers and those who work with farmers* can learn about use and management of the soils from the section that describes the soils and from the section that discusses management of soils for cultivated crops and pasture.

*Foresters and others* can refer to the section "Woodland," where the soils of the county are grouped according to their suitability for trees.

*Game managers, sportsmen, and others concerned with wildlife* will find information about soils and wildlife in the section "Use of the Soils for Wildlife."

*Engineers and builders* will find under "Engineering Applications" tables that give descriptions of the soils in the county and that name soil features affecting engineering practices and structures.

*Community planners and others* can read about the soil properties that affect the choice of homesites, commercial or industrial sites, schools, and parks in the section "Selected Nonfarm Uses of the Soils."

*Scientists and others* can read about how the soils were formed and how they are classified in the section "Formation and Classification of the Soils."

*Students, teachers, and others* will find information about soils and their management in various sections of this report.

*Newcomers in Indiana County* may be especially interested in the section "General Soil Map," where broad patterns of soils are described. They may also be interested in the section "General Nature of the County," which gives general information about the county.

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NOTICE TO LIBRARIANS

Series year and series number are no longer shown on soil surveys. See explanation on the next page.

Issued January 1968

## EXPLANATION

### Series Year and Series Number

Series year and number were dropped from all soil surveys sent to the printer after December 31, 1965. Many surveys, however, were then at such advanced stage of printing that it was not feasible to remove series year and number. Consequently, the last issues bearing series year and number will be as follows:

Series 1957, No. 23, Las Vegas-Eldorado Area, Nev.
Series 1958, No. 34, Grand Traverse County, Mich.
Series 1959, No. 42, Judith Basin Area, Mont.
Series 1960, No. 31, Elbert County, Colo. (Eastern Part)
Series 1961, No. 42, Camden County, N.J.
Series 1962, No. 13, Chicot County, Ark.
Series 1963, No. 1, Tippah County, Miss.

Series numbers will be consecutive in each series year, up to and including the numbers shown in the foregoing list. The soil survey for Tippah County, Miss., will be the last to have a series year and series number.

# SOIL SURVEY OF INDIANA COUNTY, PENNSYLVANIA

BY JAY B. WEAVER AND JOSEPH D. RUFFNER, SOIL CONSERVATION SERVICE[1]

UNITED STATES DEPARTMENT OF AGRICULTURE, SOIL CONSERVATION SERVICE, IN COOPERATION WITH THE COLLEGE OF AGRICULTURE AND AGRICULTURAL EXPERIMENT STATION OF PENNSYLVANIA STATE UNIVERSITY, AND THE PENNSYLVANIA DEPARTMENT OF AGRICULTURE, STATE SOIL AND WATER CONSERVATION COMMISSION

INDIANA COUNTY is in the west-central part of Pennsylvania (fig. 1). It covers an area of 831 square miles, or 531,840 acres. Indiana, the county seat, is near the geographical center of the county. The Conemaugh River runs along the southern border.

This county is mainly an agricultural region. Dairying is the principal type of farming, but there are general, livestock, and vegetable farms as well. Potatoes and cabbage are the most commonly grown vegetables. Hay, corn, oats, and wheat are the chief field crops; they are used mainly as feed for livestock.

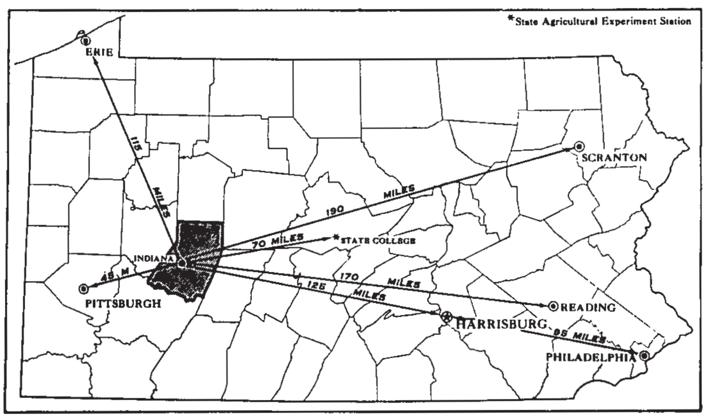


*Figure 1.*—**Location of Indiana County in Pennsylvania.**

## *How This Soil Survey Was Made*

Soil scientists made this survey to learn what kinds of soils are in Indiana County, where they are located, and how they can be used. They went into the county knowing they likely would find many soils they had already seen, and perhaps some they had not. Throughout the county, they observed steepness, length, and shape of slopes; size and speed of streams; kinds of native plants or crops; kinds of rock; and many facts about the soils. They dug many holes to expose soil profiles for study. A profile is the sequence of natural layers, or horizons, in a soil; it extends from the surface down to the parent material that has not been changed much by leaching or by roots of plants.

The soil scientists made comparisons among the profiles they studied, and they compared these profiles with those in other counties. They classified and named the soils according to uniform procedures. To use this report efficiently, it is necessary to know the kinds of groupings most used in a local classification of soils.

Soils that have profiles almost alike make up a soil series. Except for different texture in the surface layer, the major horizons of all the soils of one series are similar in thickness, arrangement, and other important distinguishing characteristics. Each soil series is named for a town or other geographic feature near the place where a soil of that series was first observed and mapped. Clymer and Ernest, for example, are the names of two soil series. All the soils in the United States having the same series name are essentially alike in natural characteristics.

Many soil series contain soils that differ in texture of their surface layer. According to such differences in texture, separations called soil types are made. Within a series, all the soils having a surface layer of the same texture belong to one soil type. Cavode silt loam and Cavode silty clay loam are two soil types in the Cavode series. The difference in texture of their surface layer is apparent from their names.

Some soil types vary so much in slope, degree of erosion, number and size of stones, or some other feature affecting their use, that practical suggestions about their management could not be made if they were shown on the soil map as one unit. Such soil types are divided into soil phases. The name of a soil phase indicates a feature that affects management. For example, Cavode silt loam, 0 to 3 percent slopes, is one of several phases of Cavode silt loam, a soil type that has a slope range of 0 to 25 percent.

After a guide for classifying and naming the soils had been worked out, the soil scientists drew the boundaries of the individual soils on aerial photographs. These pho-

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tographs show woodlands, buildings, field borders, trees, and other details that help in drawing boundaries. The soil map at the back of this report was prepared from the aerial photographs.

The areas shown on a soil map are called mapping units. On most maps detailed enough to be useful in planning management of farms and fields, a mapping unit is nearly equivalent to a phase of a soil type or to a soil type. It is not exactly equivalent, because it is not practical to show on such a map all the small, scattered bits of soil of some other kind that have been seen within an area that is dominantly of a recognized soil type or soil phase.

In preparing some detailed maps, the soil scientists have the problem of delineating an area where two or more kinds of soils occur in such an intricate pattern and in individual areas so small in size that they cannot be shown separately on the soil map. Such an area is shown as one mapping unit and is called a complex. Ordinarily, a complex is named for the major soils in it, for example, Dekalb-Gilpin very stony loams, 12 to 35 percent slopes.

Occasionally, two or more similar kinds of soils that do not occur in regular geographic association are shown as one mapping unit because separating the soils would have little practical significance. Such a mapping unit is called an undifferentiated soil group. It is named in terms of its constituent soils. Dekalb and Ramsey channery sandy loams, 20 to 35 percent slopes, moderately eroded, is an undifferentiated soil group in Indiana County.

Also, on most soil maps, areas are shown that are so sandy, so shallow, so frequently worked by wind and water, or so disturbed by man that they are not identifiable as soils. These areas are given descriptive names, for example, Made land, Mine dumps, or Strip mine spoil. This kind of mapping unit is called a land type.

While a soil survey is in progress, samples of soils are taken, as needed, for laboratory measurements and for engineering tests. Laboratory data from the same kinds of soils in other places are assembled. Data on yields of crops under defined practices are assembled from farm records and from field or plot experiments on the same kinds of soils. Yields under defined management are estimated for all the soils.

But only part of a soil survey is done when the soils have been named, described, and delineated on the map, and the laboratory data and yield data have been assembled. The mass of detailed information then needs to be organized in such a way that it is readily useful to different groups of readers, among them farmers, managers of woodland, engineers, and homeowners. Grouping soils that are similar in suitability for each specified use is the method of organization commonly used in soil survey reports. The soil scientists set up trial groups based on the yield and practice tables and other data. They test these groups by further study and by consultation with farmers, agronomists, engineers, and others; then they adjust the groups according to the results of their studies and consultation. Thus, the groups that are finally evolved reflect up-to-date knowledge of the soils and of their behavior under present methods of use and management.

# General Soil Map

The general soil map at the back of this report shows, in color, the soil associations in Indiana County. A soil association is a landscape that has a distinctive proportional pattern of soils. It normally consists of one or more major soils and at least one minor soil, and it is named for the major soils. The soils in one association may occur in another, but in a different pattern.

A map showing soil associations is useful to people who want a general idea of the soils in a county, who want to compare different parts of a county, or who want to know the location of large tracts that are suitable for a certain kind of farming or other land use. Such a map is not suitable for planning the management of a farm or field, because the soils in any one association ordinarily differ in slope, depth, stoniness, drainage, and other characteristics that affect management.

Described in the pages following are the eight soil associations in Indiana County.

### 1. Gilpin-Weikert-Ernest association

*Medium-textured and moderately coarse textured soils on moderately sloping to steep valley slopes and narrow to broad, rolling ridgetops*

This association is characterized by rolling hills that have narrow to broad, rolling ridgetops and by narrow, stream-cut valleys that have gently sloping to steep sides (fig. 2). The streams are small but numerous. This association occurs mainly in the western part of the county but extends to the central and north-central parts. In the north-central part, the ridgetops are remnants of an old plateau and, in most places, are capped by sandstone. They are flanked by short, steep, escarpmentlike slopes. This association makes up about 32 percent of the county.

Gilpin and Weikert soils each make up about 40 percent of this association. Ernest soils, together with Dekalb soils and other minor soils, make up the rest.

Gilpin soils, which are moderately deep and well drained, occupy most of the ridgetops. They also occur

**Figure 2.—A typical area in the Gilpin-Weikert-Ernest soil association. The young Christmas trees are on the Gilpin and Weikert soils.**

on the valley sides and share the moderately sloping to steep upper parts of the slopes with the shallow, well-drained Weikert soils. The moderately well drained Wharton soils and the somewhat poorly drained Cavode soils occur in narrow, horizontal bands along the slopes; the bands are wider on gently sloping benches. The deep, moderately well drained or somewhat poorly drained Ernest soils and the poorly drained Brinkerton soils occupy the gently sloping or moderately sloping lower parts of the slopes.

The moderately deep, well-drained Dekalb soils are the most extensive soils on the sandstone-capped ridgetops, but they share these areas with the deep, well-drained Clymer soils, the moderately well drained or somewhat poorly drained Cookport soils, and the shallow, well-drained Ramsey soils. The poorly drained Atkins soils and the moderately well drained or somewhat poorly drained Philo soils cover the flood plains of the streams and are subject to frequent flooding.

Much of this association is idle and has been taken over by brush and weeds. Nevertheless, many of the steep slopes have been planted to Christmas trees. The rolling ridgetops and the more gentle slopes are used for farming, mainly dairying. The broad, gently sloping ridgetops have only slight or moderate limitations for residential development, but most of the other areas are too steep. Farmsteads, houses, villages, and improved highways are mainly on the gently sloping Ernest soils.

### 2. Gilpin-Wharton-Cavode association

*Medium-textured soils on moderately sloping to moderately steep valley slopes and broad, gently sloping hilltops and benches*

This is an area of rolling hills carved out by streams that form a dendritic, or branching, drainage pattern. The broad, gently sloping hilltops and the narrow valleys give the area a somewhat undulating relief. This association occurs mainly in the northern and central parts of the county. It covers about 19 percent of the county.

Gilpin soils make up about 50 to 60 percent of this association, Wharton soils 20 to 30 percent, and Cavode soils and some minor soils 10 to 20 percent. The pattern of soils is complex (fig. 3) because the parent materials are interbedded. Generally the moderately deep, well-drained Gilpin soils are on the more sloping hillsides; and the deep, moderately well drained Wharton soils and the somewhat poorly drained Cavode soils occupy the broad, gently sloping hilltops and benches. The deep, moderately well drained or somewhat poorly drained Ernest soils and the poorly drained Brinkerton soils occur in the colluvial areas on the less sloping lower part of the hillside. The poorly drained Atkins soils and the moderately well drained or somewhat poorly drained Philo soils occur on the flood plains of the streams and are flooded frequently or occasionally.

Minor soils occurring on the more sloping hillsides with the Gilpin soils are the shallow Ramsey soils and the moderately deep Dekalb soils, both of which are well drained and are of sandstone origin; and the shallow, droughty Weikert soils, which are of hard-shale origin. Small areas of poorly drained Armagh soils occur within areas of the Cavode soils.

This association is used to a great extent for agriculture because a large part of it is on gentle or moderate slopes. A considerable acreage of the Wharton and Cavode soils has been improved by tile drainage.

Most of the strip mines in the county are within this association. Three or four seams of coal have been stripped on a single hill in the northeastern part of the county, but strip mining is most extensive south of McIntyre.

The soils of this association have moderate or severe limitations for residential development. Gilpin and Weikert soils generally are too shallow for septic-tank systems, and Wharton and Cavode soils have a seasonal high water table that limits their desirability as homesites or highway locations.

### 3. Gilpin-Clymer-Wharton association

*Medium-textured soils on broad, gently sloping and moderately sloping uplands*

This association is characterized by rolling hills that have gently sloping, plateaulike hilltops. The streams have narrow flood plains and form a dendritic drainage pattern. Generally, the flood plains are flanked by gentle or moderate slopes. Next to the Conemaugh River, however, and north of Centerville and Smokeless, the valley slopes are moderately steep or steep. This association covers about 10 percent of the county and is confined to the southeastern part.

Gilpin soils make up 35 to 45 percent of this association, and Clymer soils 25 to 35 percent. Wharton soils and the minor soils in the area make up 20 to 30 percent. Gilpin soils occur mainly on the sloping hillsides. They are moderately deep, well-drained soils. The deep, well-drained Clymer soils and the moderately well drained Wharton soils share the hilltops. The shallow Ramsey soils and the moderately deep Dekalb soils, both of which are well drained and somewhat droughty, occupy some of the hillsides, and the shallow, droughty Weikert soils occur with Gilpin soils on other hillsides. Small areas of the moderately well drained or somewhat poorly drained Cookport soils are on hilltops, within areas of Clymer soils. The somewhat poorly drained Cavode soils are extensive on broad hilltops adjacent to Wharton soils. The deep, moderately well drained or somewhat poorly drained Ernest soils and the poorly drained Brinkerton soils occur on the gently sloping lower part of the hillsides. The poorly drained Atkins soils and the moderately well drained or somewhat poorly drained Philo soils are on the flood plains.

This association is well suited to crops. Much of the acreage on the gently sloping hilltops is suitable for truck crops.

Clymer soils generally have slight or moderate limitations for residential development; Gilpin and Wharton have moderate or severe limitations. Houses have been constructed in recent years along the improved roads, especially in the vicinity of Armagh.

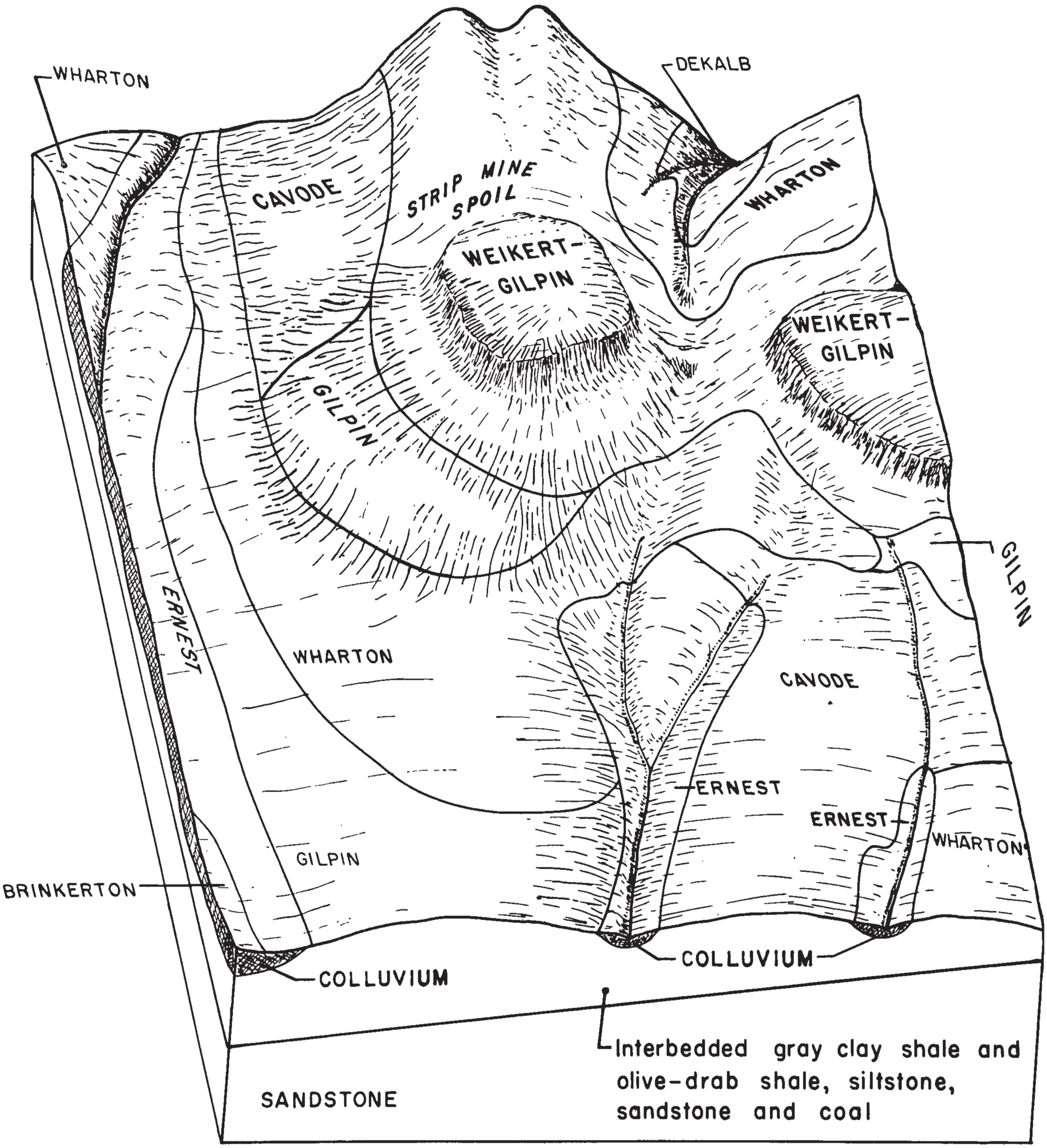


*Figure 3.*—**Parent material, position, and pattern of soils in the Gilpin-Wharton-Cavode association.**

## 4. Gilpin-Wharton-Upshur association

*Medium-textured and moderately fine textured soils on broad, gentle uplands; on gently sloping and moderately sloping benches; on moderately sloping to moderately steep hills; and on narrow, rolling hilltops*

This is an area of broad, gentle uplands; gently sloping to moderately sloping benches; moderately sloping to moderately steep hills; and narrow, rolling hilltops (fig. 4). The slopes are mostly gentle near the headwaters of small streams and stronger downstream. The flood plains of the streams are narrow. Narrow bands of colluvium run along the base of the hillsides. This association occurs mainly in the southwestern and central parts of the county. It covers about 6 percent of the county.

Gilpin soils make up 50 to 60 percent of this association, and Wharton soils 20 to 30 percent. Areas where Upshur soils are mixed with Gilpin soils and areas occupied by the minor soils together make up 10 to 30 percent.

Gilpin soils, which are moderately deep and well drained, occur on most of the valley slopes, hills, and hilltops. The deep, moderately well drained Wharton soils occupy most of the broad, gentle uplands and the benches. The deep or moderately deep, well-drained Upshur soils occur with both the Gilpin and the Wharton soils but are most common on small benches and on the rolling hilltops. The shallow, droughty Weikert soils are mixed with Gilpin soils in some places. Also, narrow bands of somewhat poorly drained Cavode soils are mixed with Gilpin soils. Cavode soils occur with Wharton soils on the gentle uplands. The deep, moderately well drained or somewhat poorly drained Ernest soils and the poorly drained Brinkerton soils occur on the gently sloping lower part of the valley slopes. The poorly drained Atkins soils and the moderately well drained or somewhat poorly drained Philo soils occur on the flood plains.

Gilpin and Wharton soils are used extensively for farming, principally dairy farming. Many areas of Upshur soils are gullied (fig. 5) and are in brushy pasture or are idle, but some areas have been planted to trees. Slips or small landslides are common on moderately sloping to moderately steep areas of Upshur soils.

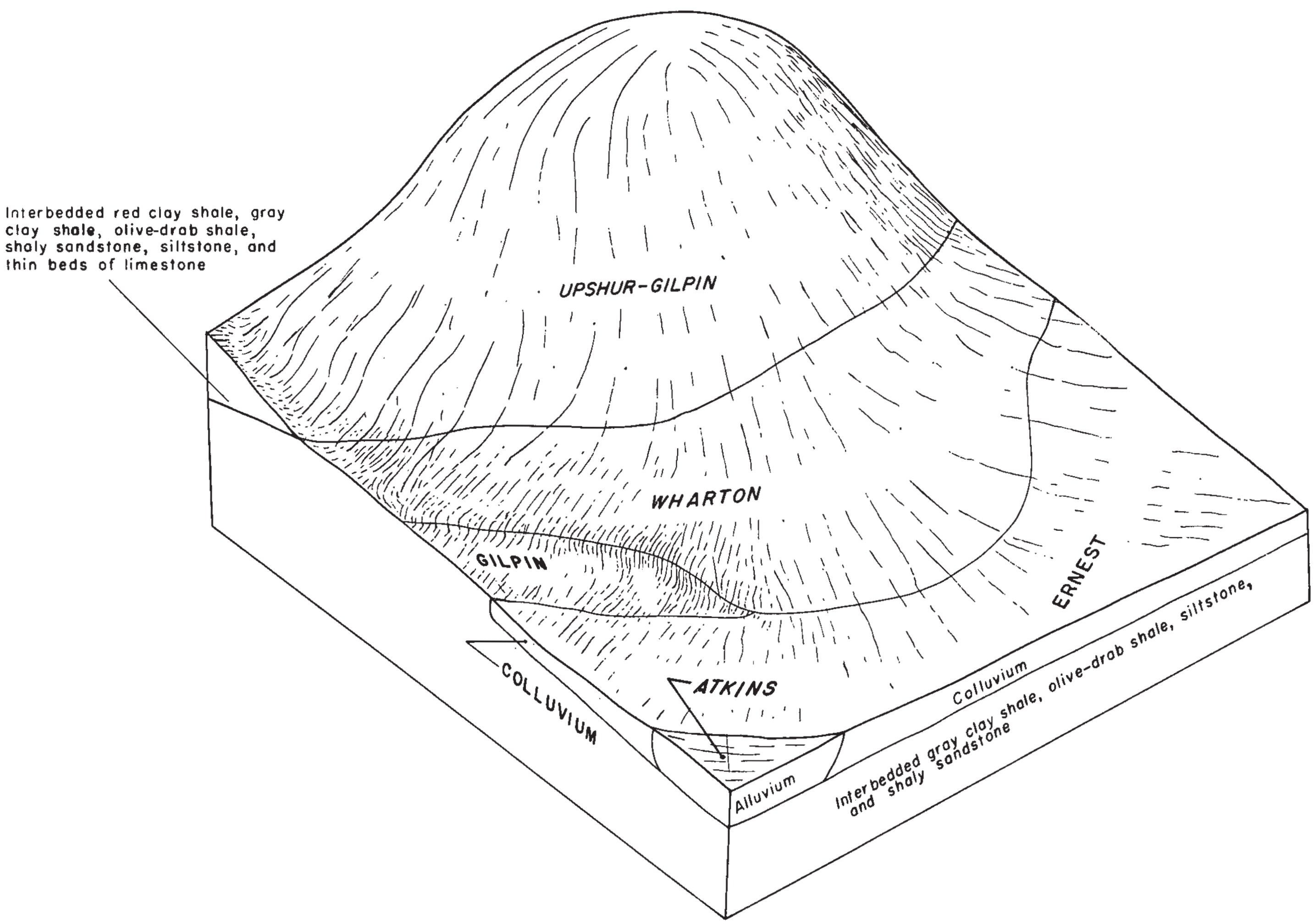


***Figure 4.*—Parent material, position, and pattern of soils in the Gilpin-Wharton-Upshur association.**

*Figure 5.*—**Concentrated runoff has cut many deep gullies, such as this, on the Upshur soils of the Gilpin-Wharton-Upshur association. Upshur soils are slowly permeable, and consequently they are highly erodible in sloping areas.**

The soils of this association have moderate or severe limitations for residential development. Problems of ineffective septic tank systems, wet basements, and unstable foundations are likely to develop, especially in areas of Cavode, Upshur, and Gilpin soils. Nevertheless, many houses and other structures, and roads as well, have been built on soils of this association near the city of Indiana.

### 5. Gilpin-Westmoreland-Guernsey association

*Medium-textured soils on moderately sloping to moderately steep valley slopes, gently sloping benches, and rolling hills*

This association is dissected by many small streams. The topography is rolling and hilly and includes some gently sloping benches, saddles, and hilltops. The flood plains and the colluvial areas at the foot of the valley slopes are narrow and of small extent. Pittsburgh coal underlies this association, as is indicated by an almost continuous band of old strip-mine spoils that follows the contour of the hills. This association is at the southwestern edge of the county. It is the smallest of the soil associations, and occupies only about 1 percent of the county.

Gilpin soils make up about 40 percent of this association, Westmoreland soils about 25 percent, and Guernsey soils about 20 percent. The minor soils make up the rest.

The Gilpin and Westmoreland soils, both of which are moderately deep and well drained, occupy most of the hilltops and the moderately sloping to moderately steep hillsides. The moderately well drained or somewhat poorly drained Guernsey soils occupy the gentle, concave slopes on the uplands and the benches. They also occur as narrow bands on the hillsides within areas of Westmoreland soils. The deep, moderately well drained or somewhat poorly drained Clarksburg soils occupy the lower part of the valley slopes. The poorly drained Atkins soils and the moderately well drained or somewhat poorly drained Philo soils cover the narrow flood plains.

This association is especially well suited to use as grassland. Much of the area is taken up by dairy farms. Old pastures generally are covered with bluegrass.

Residential development is centered mainly around West Lebanon, Elders Ridge, and Nowrytown. The soils have moderate or severe limitations if used as residential sites. Guernsey soils have a seasonal high water table, which is likely to cause problems of ineffective septic tank systems, unstable foundations, and wet basements.

### 6. Dekalb-Clymer-Cookport association

*Medium-textured and moderately coarse textured soils on steep valley slopes, on ridges, and on broad, gently rolling ridgetops*

This is an area of broad, gently rolling ridgetops and of narrow stream-cut valleys that have steep sides. The lower part of the valley slopes, bordering the flood plains, consists of a narrow band of colluvium. Near the headwaters of the streams, the colluvial slopes are broader and bowl shaped. The colluvial material and the floodplain sediment contain many large boulders that have washed or slid from the sandstone uplands. This association occurs mainly in the eastern and northern parts of the county. It makes up about 14 percent of the county.

Dekalb soils and the associated Ramsey soils together make up 50 to 60 percent of this association, and Clymer soils make up 15 to 25 percent. Cookport soils and the minor soils make up 15 to 25 percent.

Dekalb soils, which are moderately deep and well drained, cover the steep valley slopes and ridges. The shallow, well-drained Ramsey soils occur with Dekalb soils in these areas. Dekalb soils share the ridgetops with the deep, well-drained Clymer soils and the moderately well drained or somewhat poorly drained Cookport soils (fig. 6). Cookport soils typically occupy flat or slightly concave areas.

Other soils on the uplands include the poorly drained Nolo soils; the well-drained Gilpin soils; the moderately well drained Wharton soils; and the somewhat poorly drained Cavode soils. In the colluvial areas are the moderately well drained or somewhat poorly drained Ernest soils and the poorly drained Brinkerton soils. On the flood plains are the moderately well drained or somewhat poorly drained Philo soils and the poorly drained Atkins soils.

Woods or woodland pasture covers most of this association. Much farmland has been converted to forest or to Christmas tree plantations. Other areas formerly cultivated are idle and are covered with laurel, huckleberry, and small saplings. Large areas near Strongstown, Blaides, and Spruce are used for potatoes. The farms

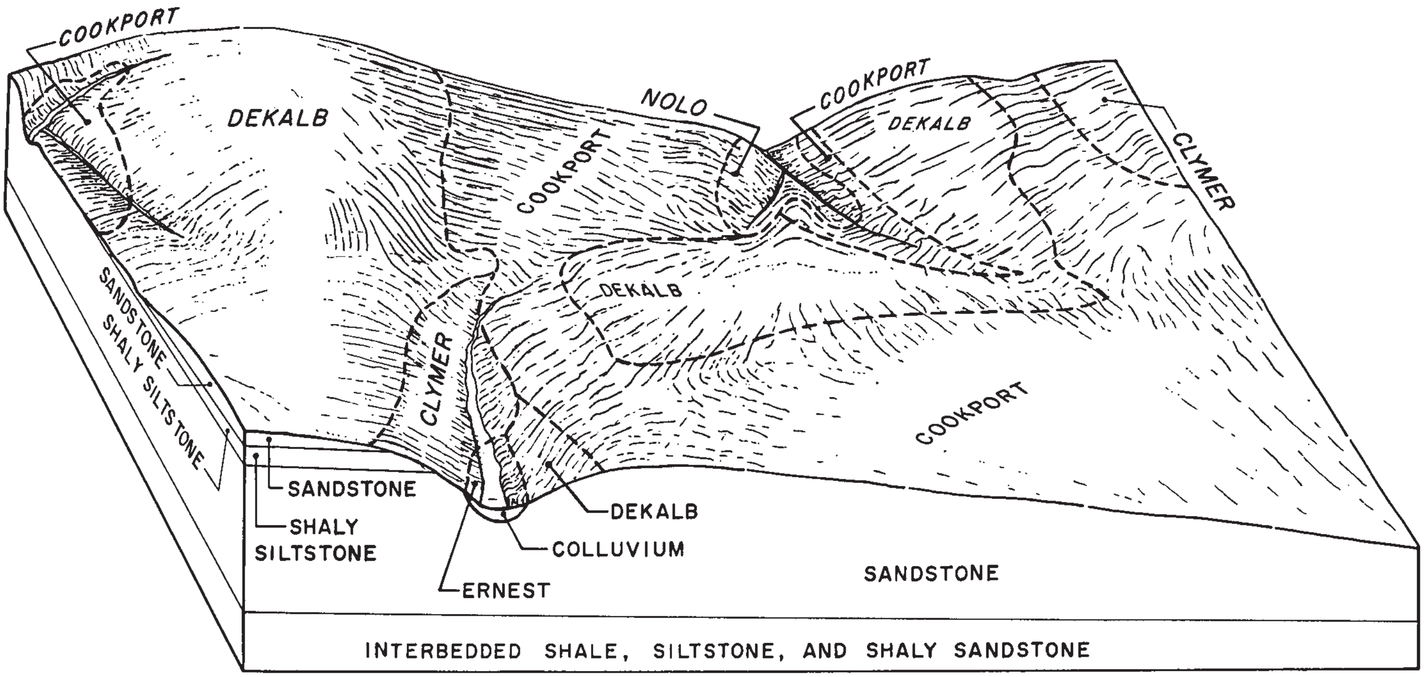


*Figure 6.*—**Parent material, position, and pattern of soils in the Dekalb-Clymer-Cookport association.**

within this association are mostly either dairy farms or part-time farms.

Residential development in this association is mostly in the small towns and villages and along improved highways. Clymer soils have slight or moderate limitations for residential development. Dekalb soils have severe limitations because they are shallow, and Cookport soils have severe limitations because of a high water table.

### 7. Dekalb-Clymer-Ernest association

*Very stony, medium-textured and moderately coarse textured soils on steep valley slopes, on ridges, and on broad, gently sloping or moderately sloping ridgetops*

This association is characterized by narrow flood plains along the small streams, narrow to broad flood plains along the larger streams and the Conemaugh River, and steep slopes that rise from the flood plains to gently sloping or moderately sloping ridgetops. Large fragments of sandstone have washed or have slid from the ridges to the gently sloping lower part of the valley slopes and to the flood plains. Along the Conemaugh River and in some other small areas, these fragments are so numerous that they form a rubble layer on the surface of the soil. This association is in the southeastern part of the county. It covers about 11 percent of the county.

Dekalb and Ramsey soils together make up 65 to 75 percent of this association, and Clymer soils make up 15 to 20 percent. Ernest soils and the minor soils make up 10 to 20 percent.

Dekalb soils, which are moderately deep, very stony, and well drained, cover the valley slopes, the ridges, and a large part of the ridgetops. The shallow, very stony, well-drained Ramsey soils occur with Dekalb soils. The deep, very stony, well-drained Clymer soils are mainly on the ridgetops. The deep, moderately well drained or somewhat poorly drained Ernest soils occupy the lower part of the valley slopes, above the flood plains.

Other soils on the uplands include the very stony, moderately well drained or somewhat poorly drained Cookport soils; and the very stony, poorly drained Nolo soils. In the colluvial areas on the lower part of the valley slopes are the deep, very stony, poorly drained Brinkerton soils. On the flood plains are the well-drained Pope soils, the moderately well drained or somewhat poorly drained Philo soils, and the poorly drained Atkins soils.

Practically all of this association is woodland. Most of the sawtimber has been cut, and the stands now consist mainly of second- and third-growth trees that are small, poorly formed, and of species that are inferior as timber.

Clymer soils have moderate limitations for residential development. Removing the many large stones from these soils would be expensive. The other soils in this association have moderate or severe limitations, either because they are shallow or because they have a high water table.

### 8. Monongahela-Allegheny-Pope-Philo association

*Medium-textured soils on terraces and flood plains*

This association consists chiefly of the first and second bottoms of the larger streams. It is an area of meandering streams, smooth flood plains, and dissected terraces (fig. 7). In most places the terraces gradually blend into the uplands, but the edge of the terraces that borders the flood plains is escarpmentlike. This association covers about 7 percent of the county.

Monongahela soils make up about 40 percent of this association, Allegheny soils about 15 percent, Pope soils about 15 percent, Philo soils about 15 percent, and minor soils about 15 percent.

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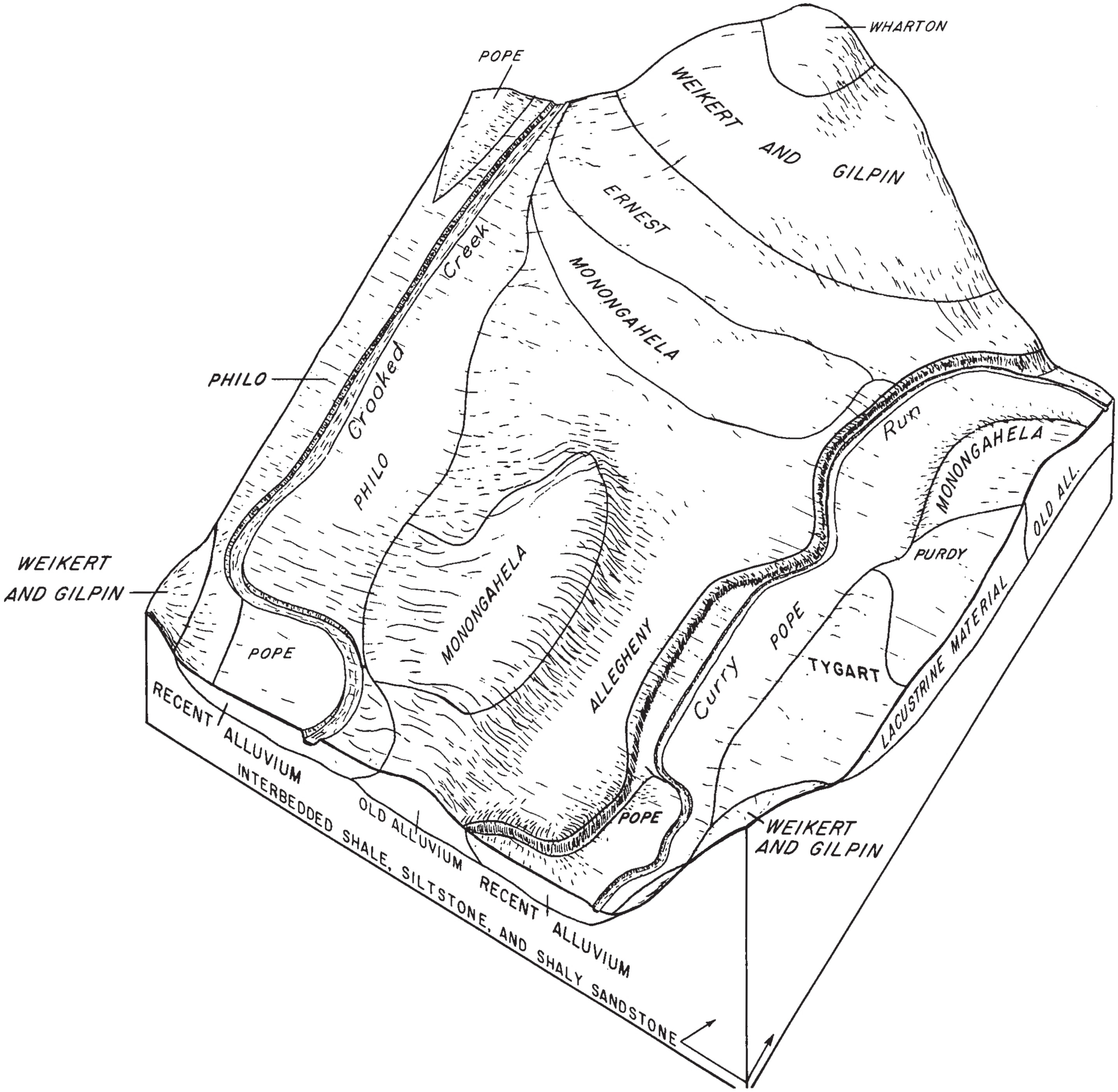


***Figure 7.*—Parent material, position, and pattern of soils in the Monongahela-Allegheny-Pope-Philo association.**

Monongahela soils occupy the broad, nearly level or gently sloping terraces; the largest areas are along the Conemaugh River. These soils are deep and moderately well drained or somewhat poorly drained; they are not subject to flooding. The deep, well-drained Allegheny soils occur within areas of Monongahela soils. The well-drained Pope soils and the moderately well drained or somewhat poorly drained Philo soils both occur in the many places on the flood plains where the elevation changes slightly.

The moderately well drained or somewhat poorly drained Tygart soils and the poorly drained or very poorly drained Purdy soils occur as flat or slightly concave places within areas of Monongahela soils. The

poorly drained Atkins soils are in low spots on the flood plains, fairly distant from the stream. All of the soils on the flood plains are subject to flooding.

The well drained and moderately well drained soils on the flood plains are farmed intensively, but the choice of crops is affected by the frequency of flooding. The wet soils on the flood plains are used for trees or for limited grazing. Most of the farm buildings are on the second bottoms, or terraces.

Some of the major roads in the county run through this association; they provide access to markets. In recent years, some of the better drained, level terraces that are adjacent to good roads have been developed for industrial and residential use.

# *Use of the Soils for Farming*

This section has four parts. The first part discusses some general principles of soil management. The second explains the capability classification system, and the third discusses use and management of the soils in each of the capability units. The fourth part gives estimated yields of the principal crops.

## General Principles of Soil Management

Most of the soils in Indiana County need lime and fertilizer for profitable crop yields. The amounts of lime and fertilizer needed depend on the kind of soil, on the crops to be grown, on past cropping, and on the level of yield desired. They should be determined by laboratory analysis of a soil sample. Information and instructions on collecting samples and on testing to determine fertilizer needs can be obtained from a local representative of the Soil Conservation Service, the county extension agent, or the staff of the Agricultural Experiment Station of Pennsylvania State University.

Applying lime and fertilizer and selecting well-suited varieties of crops are only a part of good soil management. Other practices needed in the county include providing diversion terraces and grassed waterways, draining off excess water, keeping the surface of the soil open and porous, using manure and other organic materials where and when required, working plant residue into the soil, and plowing to different depths so that a tillage pan, or plowpan, will not form. The local representative of the Soil Conservation Service can assist in planning management to conserve soil and water.

## Capability Groups of Soils

The capability classification is a grouping that shows, in a general way, how suitable soils are for most kinds of farming. It is a practical grouping based on limitations of the soils, the risk of damage when they are used, and the way they respond to treatment.

In this system all the kinds of soil are grouped at three levels: the capability class, the subclass, and the unit. The eight capability classes in the broadest grouping are designated by Roman numerals I through VIII. In class I are the soils that have few limitations, the widest range of use, and the least risk of damage when they are used. The soils in the other classes have progressively greater natural limitations. In class VIII are soils and landforms so rough, shallow, or otherwise limited that they do not produce worthwhile yields of crops, forage, or wood products.

The subclasses indicate major kinds of limitations within the classes. Within most of the classes there can be up to four subclasses. The subclass is indicated by adding a small letter, *e*, *w*, *s*, or *c*, to the class numeral, for example, IIe. The letter *e* shows that the main limitation is risk of erosion unless close-growing plant cover is maintained; *w* means that water in or on the soil will interfere with plant growth or cultivation (in some soils the wetness can be partly corrected by artificial drainage); *s* shows that the soil is limited mainly because it is shallow, droughty, or stony; and *c*, which is not used in Indiana County, indicates that the chief limitation is climate that is too cold or too dry.

In class I there are no subclasses, because the soils of this class have few or no limitations. Class V can contain, at the most, only subclasses *w*, *s*, and *c*, because the soils in it are subject to little or no erosion but have other limitations that restrict their use largely to pasture, woodland, or wildlife.

Within the subclasses are the capability units, groups of soils enough alike to be suited to the same crops and pasture plants, to require similar management, and to have similar productivity and other responses to management. Thus, the capability unit is a convenient grouping for making many statements about management of soils. Capability units are generally identified by numbers assigned locally, for example, IIe-1 or IIIe-8.

Soils are classified in capability classes, subclasses, and units in accordance with the degree and kind of their permanent limitations; but without consideration of major and generally expensive landforming that would change the slope, depth, or other characteristics of the soil; and without consideration of possible but unlikely major reclamation projects.

The eight classes in the capability system, and the subclasses in this county, are defined in the list that follows.

Class I. Soils that have few limitations that restrict their use.

Class II. Soils that have some limitations that reduce the choice of plants or require moderate conservation practices.

- Subclass IIe. Soils subject to moderate erosion if they are not protected.
- Subclass IIw. Soils that have moderate limitations because of excess water.
- Subclass IIs. Soils that have moderate limitations because of a low or moderately low water-holding capacity.

Class III. Soils that have severe limitations that reduce the choice of plants, or require special conservation practices, or both.

- Subclass IIIe. Soils subject to severe erosion if they are cultivated and not protected.
- Subclass IIIw. Soils that have severe limitations because of excess water.
- Subclass IIIs. Soils that have severe limitations because of low water-holding capacity.

Class IV. Soils that have very severe limitations that restrict the choice of plants, make careful management necessary, or both.

Subclass IVe. Soils subject to very severe erosion if they are cultivated and not protected.

Subclass IVw. Soils that have very severe limitations for cultivation because of excess water.

Subclass IVs. Miscellaneous land types that can support worthwhile vegetative cover but require careful management.

Class V. Soils that are not likely to erode but have other limitations, impractical to remove without major reclamation, that limit their use largely to pasture, woodland, or wildlife food and cover. (In Indiana County, the acreage of class V soils is small and, therefore, was combined with that of class VI soils.)

Class VI. Soils that have severe limitations that make them generally unsuitable for cultivation and that limit their use largely to pasture, woodland, or wildlife food and cover.

Subclass VIe. Soils severely limited, chiefly by risk of erosion if protective cover is not maintained.

Subclass VIw. Soils severely limited by excess water and generally unsuitable for cultivation.

Subclass VIs. Soils generally unsuitable for cultivation and limited for other uses by low water holding capacity, stones, or other features.

Class VII. Soils that have very severe limitations that make them unsuitable for cultivation without major reclamation and restrict their use largely to grazing, woodland, or wildlife.

Subclass VIIe. Soils very severely limited, chiefly by risk of erosion if protective cover is not maintained.

Subclass VIIs. Soils very severely limited by low water-holding capacity, stones, or other features.

Class VIII. Soils and landforms that have no agricultural value because of limitations that restrict their use to recreation, wildlife, water supply, or esthetic purposes.

Subclass VIIIs. Rock or soil material that has little potential for production of vegetation.

## Management by Capability Units

All the soils in one capability unit have about the same limitations, are suited to about the same kinds of crops, and can produce about the same yields. The soils in one unit, therefore, need about the same kind of management, though they may have developed from different kinds of parent materials and in different ways.

The capability units are described in the following pages. Characteristics of the soils in each unit are discussed, and management suitable for the soils is suggested. The suggestions are general, for they are based on statewide recommendations. The county extension agent or the local representative of the Soil Conservation Service can suggest specific management practices for a particular farm.

The names of the soil series represented are given in the description of each capability unit, but this does not necessarily mean that all the soils of a given series are in the same capability unit. To find what capability unit a specific soil is in, refer to the section "Descriptions of the Soils," or to the Guide to Mapping Units, which is at the back of this report.

### *Capability unit I-1*

In this unit is a deep, well-drained, medium-textured, level or nearly level Allegheny soil that occurs mostly on terraces.

This soil is easy to till but is low in natural fertility and strongly acid or very strongly acid. It has a moderately high water-holding capacity and is readily permeable to water and air. The soil is easily leached but is not subject to erosion.

If it is adequately limed and fertilized, this soil is well suited to all the crops commonly grown in the county, including truck, nursery, and orchard crops.

To help maintain the organic-matter supply and preserve good tilth, grow at least 1 year of hay and not more than 2 years of row crops in a 4-year period. Disk or shred row-crop residues. Plant a cover crop with or following a row crop, such as corn or potatoes. Apply fertilizer often and in moderate amounts. Farm the longer slopes on the contour, to promote infiltration of water.

### *Capability unit I-2*

In this unit are deep, well-drained, medium-textured and moderately coarse textured, level or nearly level Pope soils, which are on flood plains.

These soils are easy to till but are moderate in natural fertility and strongly acid or very strongly acid. They have a moderate or moderately high water-holding capacity and are readily permeable to water and air. Except along streambanks, erosion is not a problem or is only a slight problem. Flooding is a slight or moderate hazard.

If they are adequately limed and fertilized, these soils are well suited to agriculture. They are excellent for truck crops.

To help maintain the organic-matter content and preserve good tilth, grow at least 1 year of hay and not more than 2 years of row crops in a 4-year period. Disk or shred row-crop residue. Plant a cover crop, such as ryegrass, rye, or winter wheat, with or following a row crop. Lime and fertilize the moderately coarse textured soil often and in moderate amounts. Keep natural drainageways in permanent sod.

### *Capability unit IIe-1*

The soils in this unit, level to sloping Allegheny and Clymer soils, are deep, medium textured, and well drained. They are on uplands and terraces. The sloping soils have lost as much as three-fourths of their original surface layer through erosion.

These soils are easy to till but are low in natural fertility and are strongly acid or very strongly acid. They have a moderate or moderately high water-holding capacity and are easily leached.

If they are well managed, these soils are well suited to all the crops commonly grown in the county, including potatoes and truck, orchard, and nursery crops.

In a 5-year period, grow hay for at least 2 years and row crops for not more than 2 years. Plant a cover crop with the row crop, or a winter cover crop following the row crop. Leave crop residues on the surface, or work them into the soil. Construct diversion terraces on long,

nearly level and gently sloping areas, and farm these areas in contour strips. Farm the shorter slopes in contour strips or on the contour.

### *Capability unit IIe-2*

This unit consists of a moderately deep, medium-textured, well-drained, sloping Westmoreland soil, which occurs on uplands. This soil has lost up to 75 percent of its original surface layer through erosion.

This soil is moderately fertile. Unless it has been limed, it has a strongly acid surface layer, a medium acid subsoil, and a medium acid to neutral substratum. It is moderately permeable to water and air. Its capacity to hold water is moderate, and its capacity to hold and release plant nutrients is good.

If adequately limed and fertilized, this soil is well suited to most of the locally grown crops, including alfalfa and orchard crops. Potatoes are subject to scab disease.

To prevent further soil loss, grow hay for at least 2 years and row crops for not more than 1 year in a 4-year period. Construct diversion terraces on the long slopes, and farm these slopes in contour strips. Farm the short slopes in contour strips or on the contour. Keep natural drainageways in perennial hay.

### *Capability unit IIe-3*

This unit consists of shallow to moderately deep, well-drained, sloping Dekalb and Gilpin soils, which are on uplands. In fields that have been farmed for long periods, these soils have lost much of their original surface layer through erosion.

Because of good internal drainage and good aeration, these soils warm up early in spring. They are low in natural fertility and are strongly acid or very strongly acid. The water-holding capacity of the Dekalb soil is low, and that of the Gilpin soil is moderately low. Of the two, the Dekalb soil is more readily leached.

If adequately limed and fertilized, these soils are moderately well suited or well suited to all the locally grown farm crops. Much of the acreage is in the cooler eastern and northern parts of the county where potatoes and oats grow well. Because of the low or moderately low water-holding capacity, crops grow best in wet years.

In a 4-year period, grow hay for at least 2 years and row crops for not more than 1 year. Follow a row crop with a cover crop. Fertilize the Dekalb soil often and in moderate amounts. Construct diversion terraces on the long slopes, and farm these areas in contour strips. Farm the short slopes in contour strips or on the contour (fig. 8).

### *Capability unit IIe-4*

This unit is made up of gently sloping, deep, medium-textured Clarksburg, Guernsey, and Vandergrift soils, which are in valleys. These soils have lost as much as three-fourths of their original surface layer through erosion.

The water-holding capacity of these soils is moderate or moderately high, and the capacity to store and release plant nutrients is good. Natural fertility is moderate or moderately high. Internal drainage is somewhat poor or moderately good, and permeability is slow in the lower part of the subsoil.

***Figure 8.*—These sloping Gilpin soils have been farmed in contour strips to help control erosion. Ernest soils occupy the gentle lower part of the slope.**

If they are adequately limed and fertilized and artificially drained, these soils are very good for corn, oats, and grass. Generally, they are too wet and heavy for potatoes. They are excellent for pasture, but are easily compacted if grazed when wet. Alfalfa, winter barley, and wheat are often damaged by heaving.

In a 4-year period, grow hay for at least 2 years and row crops for not more than 1 year. Follow a row crop with a cover crop or with winter grain. If corn is grown, shred or disk the cornstalks. Drain wet-weather springs and low spots by means of tile drains. Construct diversions at the base of the slopes adjacent to the Clarksburg and Vandergrift soils. Use diversion terraces and graded strips on long, gentle slopes; use graded strips on short slopes; and keep natural draws in sod.

### *Capability unit IIe-5*

Gently sloping, deep, medium-textured Cookport, Ernest, Monongahela, and Wharton soils make up this unit. These somewhat poorly drained or moderately well drained soils occur on uplands, on the lower part of valley slopes, and on terraces. In some fields that have been cultivated for long periods, much of the original topsoil has eroded away.

These soils are strongly acid or very strongly acid. They are low or moderately low in natural fertility, but they store and release plant nutrients well. The water-holding capacity is moderate or moderately high. Water and air move slowly through the lower part of the subsoil.

These soils are good for corn, oats, and grass but need to be drained, limed, and fertilized. Ernest soils are very good for pasture. Alfalfa, winter barley, and wheat are often damaged in spring by heaving. In damaged fields the foliage is yellowish green and the stands are uneven. Damage generally is less evident on Wharton soils.

In a 4-year period, grow hay for at least 2 years and corn for not more than 1 year. Plant ryegrass, rye, or wheat for winter cover following the corn. Shred or disk the cornstalks. Install tile drains in seep areas and in low spots. Use graded strips or rows on short slopes. Use diversion terraces and graded strips on long, gentle slopes. Construct diversions on or at the base of the

slopes adjacent to the Ernest and Monongahela soils. Keep natural draws in grass.

### *Capability unit IIw-1*

This unit consists of deep, medium-textured, moderately well drained or somewhat poorly drained, level or nearly level soils of the Cookport, Ernest, Monongahela, and Wharton series. These soils are on uplands, in valleys, and on terraces. They have a firm layer, or fragipan, in the lower part of their subsoil. This layer impedes the movement of water and restricts the growth of plant roots. It is more dense and more nearly impermeable in the Cookport and Monongahela soils than in the others.

These soils are strongly acid or very strongly acid and are low or moderately low in natural fertility. Their capacity to hold and release plant nutrients is good, and their capacity to hold moisture is moderate or moderately high.

Corn, oats, clover, and grass grow well if these soils are artificially drained and adequately limed and fertilized. Alfalfa, winter barley, and wheat are often damaged in spring by waterlogging. Harvesting potatoes may be difficult because the soils are sometimes wet in fall.

In a 4-year period, grow hay for at least 2 years and corn for not more than 1 year. Plant a cover crop with or following the corn. Shred or disk the cornstalks. Use natural drainageways or construct outlets or open ditches to carry off water picked up by a drainage system. Install tile drains or dig ditches across the slope to drain low spots and wet areas. Use both tile drains and open ditches where feasible. To intercept runoff from adjacent hills, construct diversion terraces at the base of the slope. Use graded strips on long, nearly level slopes.

### *Capability unit IIw-2*

In this unit is a deep, moderately well drained or somewhat poorly drained, medium-textured Philo soil, which is on flood plains. This level or nearly level soil is occasionally to frequently flooded.

Because of a seasonal high water table, this soil is wet for short periods. It is readily drained, however, when the water table goes down, because permeability is moderate. The natural fertility of this soil is moderate. The water-holding capacity is moderately high; consequently, crops grow well in dry years.

Pasture, hay, corn, and oats are well suited to this soil. Truck crops grow well where the soil has been drained artificially and flooding is infrequent or occasional.

In a 4-year period, grow hay for at least 2 years and row crops for not more than 1 year. Plant a cover crop, such as ryegrass, rye, or winter wheat, following the row crop. Shred or disk crop residue. Install tile drains in low spots and in wet areas. To intercept runoff from adjacent slopes, construct diversion terraces at the base of the slope. Use frequently flooded areas only for pasture.

### *Capability unit IIs-1*

Making up this unit are level or nearly level, shallow to moderately deep, well-drained Dekalb and Gilpin soils, which are on uplands.

These soils are low in natural fertility and are strongly acid or very strongly acid. The water-holding capacity of the moderately coarse textured Dekalb soil is low, and that of the medium-textured Gilpin soil is moderately low. Of the two, the Dekalb soil is more readily leached.

If adequately limed and fertilized, these soils are moderately well suited or well suited to most of the locally grown crops, including potatoes. Crops grow best in wet years.

On the long slopes, grow at least 1 year of hay and not more than 2 years of row crops in a 4-year period. Seed ryegrass, rye, or wheat as a cover crop if oats follow the row crop. Disk or shred the row-crop residue. Apply lime and fertilizer to the Dekalb soil often and in moderate amounts. Cultivate nearly level areas on the contour, in order to intercept water and promote infiltration. Contour stripcropping helps to control erosion and conserve moisture on the somewhat stronger slopes.

### *Capability unit IIIe-1*

This unit consists of deep, well-drained, medium-textured Allegheny and Clymer soils on uplands and terraces. Some of these sloping to moderately steep soils have lost much of their original surface layer.

These soils are easy to till. They are low in natural fertility and are strongly acid or very strongly acid. Their water-holding capacity is moderate or moderately high.

If adequately limed and fertilized, these soils are good for all the crops commonly grown in the county, including potatoes, truck crops, and orchard crops. They are well suited to deep-rooted plants.

In a 4-year period, grow at least 2 years of hay and not more than 1 year of row crops. Plant ryegrass, rye, or wheat with or following the row crop to provide winter cover. Disk or shred the row-crop residue. Construct diversion terraces on the long slopes, and farm both the long and the short slopes in contour strips. Lift plows when crossing natural drainageways to avoid damaging the sod.

### *Capability unit IIIe-2*

In this unit is a moderately deep, moderately steep, well-drained, medium-textured Westmoreland soil, which is on the uplands. This soil has lost much of its original surface layer.

This soil is not easily leached. It is moderately permeable to air and water and has a moderate water-holding capacity. It is moderate in natural fertility.

If adequately limed and fertilized, this soil is well suited to most of the crops grown in the county. It is very good for alfalfa and for orchards. Potatoes are subject to scab disease.

In a 5-year period, grow hay for at least 3 years and row crops for not more than 1 year. To provide winter cover, plant ryegrass, rye, or wheat following the row crop. Disk or shred the row-crop residue. Construct diversion terraces on the long slopes, and farm both the long and the short slopes in contour strips. Keep drainageways in sod.

### *Capability unit IIIe-3*

Making up this unit are shallow to moderately deep, well-drained, moderately steep Dekalb and Gilpin soils,

which are on the uplands. In some places these soils have lost up to 75 percent of their original surface layer through erosion.

These soils warm up early and, therefore, can be tilled early in spring. They are low in natural fertility and are strongly acid or very strongly acid. The water-holding capacity of the Dekalb soil is low, and that of the Gilpin soil is moderately low. Of the two, the Dekalb soil is more readily leached.

Most crops grow well or moderately well on these soils if management is good. Potatoes grow well if sufficient moisture is available during the growing season, and alfalfa grows well if large amounts of lime and fertilizer are applied.

In a 5-year period, grow hay for at least 3 years and row crops for not more than 1 year. To provide winter cover, plant a cover crop following the row crop. Disk or shred the row-crop residue to produce mulch. Apply lime and fertilizer to the Dekalb soil often and in moderate amounts. To help increase the water-holding capacity, apply manure or other organic materials whereever practical. Construct diversion terraces on the long slopes, and farm both the long and the short slopes in strips on the contour. Keep drainageways in sod.

### *Capability unit IIIe–4*

The Upshur and Gilpin soils in this unit are moderately deep, well drained, and moderately fine textured. They occur on gently sloping uplands.

These soils are moderately high in natural fertility but have a moderately low water-holding capacity. In most places they have a sticky, plastic, slowly permeable subsoil that shrinks and cracks when it dries. Eroded areas are cloddy and difficult to till.

These soils are good for most cultivated crops but are better for hay and pasture. They are well suited to alfalfa. Because of the heavy-textured plow layer, potatoes grown in these soils have poor form; harvesting potatoes is difficult because the plow layer is wet and sticky.

In a 5-year period, grow hay for at least 3 years and row crops for not more than 1 year. Do not till or graze these soils when wet. Plant a winter cover crop following the row crop. Disk or shred the row-crop residue. Construct diversion terraces on the long slopes, and farm these slopes in contour strips. Farm the short slopes in contour strips or on the contour. Keep drainageways in sod.

### *Capability unit IIIe–5*

In this unit are shallow or very shallow, well-drained, medium-textured Gilpin and Weikert soils. These soils occur on uplands. They are strongly acid and are low in natural fertility. Their water-holding capacity is low or very low. Permeability is moderately rapid or rapid.

These soils are suited to crops that can withstand droughtiness during the growing season, although in wet years they yield almost as much as deep, well-drained soils and more than somewhat poorly drained or poorly drained soils.

In a 5-year period, grow at least 3 years of hay and not more than 1 year of row crops. Seed a cover crop with the row crop. Disk or shred the row-crop residue. Apply manure or other organic material to help increase the water-holding capacity. Use diversions and contour strips on long, gentle slopes. Farm short slopes on the contour, in order to intercept water and to promote infiltration, and thus help to control erosion.

### *Capability unit IIIe–6*

In this unit are deep, moderately well drained or somewhat poorly drained, medium-textured Clarksburg and Vandergrift soils. These sloping soils occur in valleys. They have lost much of their original surface layer.

Because permeability is slow in the lower part of the subsoil, these soils have a seasonal high water table. They hold a moderate or moderately large supply of moisture for plants and are moderate or moderately high in natural fertility.

If adequately limed and fertilized, these soils are good for corn, oats, and grass. They are very good for pasture. Alfalfa, wheat, and winter barley may be damaged by heaving.

In a 5-year period, grow hay for at least 3 years and row crops for not more than 1 year. Plant a cover crop following the row crop. Disk or shred the row-crop residue. Drain seeps with tile. To intercept runoff from the adjacent uplands, construct diversion terraces at the base of the slopes. Use graded strips. Keep drainageways in good sod by topdressing with lime and fertilizer. Do not till these soils when they are wet, and restrict grazing.

### *Capability unit IIIe–7*

In this unit are deep, moderately well drained or somewhat poorly drained, medium-textured Cookport, Ernest, Monongahela, and Wharton soils. These soils occur on uplands, on the lower part of valley slopes, and on terraces. Except for the gently sloping, severely eroded Ernest soil, the soils in this unit are sloping and moderately eroded. In most places much of the original surface layer has eroded away.

Because the lower part of the subsoil is slowly permeable, these soils have a seasonal high water table. They are strongly acid or very strongly acid and low or moderately low in natural fertility. They have a moderate water-holding capacity.

These soils are good for corn, oats, and grass but need to be drained, limed, and fertilized. Alfalfa, wheat, and winter barley are often damaged by heaving.

In a 5-year period, grow hay for at least 3 years and corn for not more than 1 year. Follow the corn with a winter cover crop. Disk or shred the cornstalks. Drain wet-weather springs with tile. Use diversions and contour strips on long slopes, and graded strips on short slopes. To protect Ernest and Monongahela soils from runoff from the adjacent uplands, construct diversions at the base of the upland slopes. Where Ernest soils are gullied and severely eroded, construct diversions beyond the head of the gullies and establish a close-growing sod in the gullies. Keep drainageways well sodded by topdressing with lime and fertilizer.

### *Capability unit IIIe–8*

In this unit is a sloping, somewhat poorly drained, medium-textured Cavode soil, which is on uplands. Because of a slowly permeable subsoil and substratum, this soil has a seasonal high water table. It is very strongly

acid and is low in natural fertility. Its capacity to hold water for plants is moderate, and its capacity to hold and release plant nutrients is good. This soil puddles readily and erodes easily.

If drained, limed, and fertilized, this soil is fair to good for corn, oats, and grass. Alfalfa, wheat, and winter barley are often damaged by heaving. Potatoes, fruit trees, and truck crops generally are adversely affected by the poor internal drainage.

In a 5-year period, grow at least 3 years of hay and not more than 1 year of corn. Plant a cover crop of ryegrass or rye. Disk or shred the cornstalks. Drain wet-weather springs. Use diversions and graded strips on long slopes, and graded strips on short slopes. Lift plows when crossing drainageways to avoid damaging the sod. Do not till these soils when they are wet, and control grazing.

### *Capability unit IIIw-1*

This unit consists of the somewhat poorly drained, medium-textured Cavode and Tygart soils, which occur on uplands and terraces.

These are not fertile soils, and they are very strongly acid. They have a moderate capacity for holding water and a good capacity for holding and releasing plant nutrients. The surface layer is easily compacted if grazed or tilled when wet. Water moves so slowly through the subsoil and substratum that these soils remain waterlogged until late in spring. They are hard to drain artificially because they are level or nearly level and have poor internal drainage.

If limed, fertilized, and drained, these soils are fair to good for corn, oats, and hay. They are not good for potatoes, truck crops, and orchard crops. Alfalfa, wheat, and winter barley may be damaged by heaving and generally grow poorly in spring.

In a 5-year period, grow hay for at least 3 years and corn for not more than 1 year. Seed red clover, alsike clover, and timothy in short rotations. Plant birdsfoot trefoil and timothy or reed canarygrass for perennial hay. Plant a winter cover crop of ryegrass or rye following the row crops. Disk or shred crop residue, and work it into the soil. Drain seep areas and low spots by installing tile or digging ditches if outlets are available. In other places, if drainage is possible, use either open ditches or bedding, or a combination of open ditches and tile drains. When tile is installed, backfill with porous materials. Construct diversion terraces at the base of adjacent slopes. Do not till these soils when they are wet, and restrict grazing.

### *Capability unit IIIw-2*

This unit consists of gently sloping, somewhat poorly drained, medium-textured Cavode and Tygart soils, which occur on uplands and terraces. In many places up to 75 percent of the original surface layer has washed away.

These soils are not fertile, and they are very strongly acid. They have a moderate capacity for holding water and a good capacity for holding and releasing plant nutrients. The root zone is somewhat shallow because of poor aeration and wetness in the lower part of the subsoil. Because the subsoil and substratum are slowly permeable, the surface layer is saturated during the wetter periods. When wet, the surface layer is easily compacted by farm machinery and livestock; and when compacted, it impedes the penetration of roots and the infiltration of rainwater. Runoff thus increases, and the erosion hazard is intensified.

If they are limed, fertilized, and drained, these soils are fair to good for corn, oats, and hay. They are not good for potatoes, alfalfa, and winter grain.

In a 5-year period, grow hay for at least 3 years and corn for not more than 1 year. To provide winter cover, plant ryegrass or winter grain following the corn. Disk or shred the cornstalks, and leave the residue on or near the surface. Use a random system of tile drains to dry seep spots and low areas. Backfill over the tile with porous materials. Construct diversions on long slopes, for drainage and erosion control. Use graded strips to help control excess surface water and thus reduce erosion. Do not till these soils when they are wet, and restrict grazing.

### *Capability unit IIIs-1*

This unit consists of level or nearly level, shallow and moderately deep, well-drained, medium-textured Gilpin and Weikert soils. These soils are on the uplands. They are moderately eroded, and in most places their plow layer consists in part of former subsoil and contains many shale chips.

The water-holding capacity of these soils is low during the growing season. Permeability is moderately rapid or rapid. The capacity for holding and releasing plant nutrients is fair. Natural fertility is low, and the reaction is strongly acid.

These soils are suited to crops that withstand droughtiness during the growing season. Yields of corn, potatoes, and truck crops are poor in dry years. In wet years, however, or in years of well-distributed rainfall, yields compare favorably with those of deep, well-drained soils and generally are better than those of somewhat poorly drained or poorly drained soils.

In a 4-year period, grow hay for at least 2 years and row crops for not more than 1 year. Plant a cover crop of ryegrass, winter wheat, or rye following the row crop. Disk or shred the row-crop residue. Apply manure to improve the water-holding capacity. Farm the long, nearly level areas on the contour, to promote infiltration of rainwater.

### *Capability unit IVe-1*

Making up this unit are shallow to moderately deep, well-drained, steep or moderately steep Dekalb, Ramsey, and Gilpin soils, which are on the uplands. In many places these soils have lost up to 75 percent of their original surface layer through erosion.

These soils are low in natural fertility and are strongly acid or very strongly acid. They have a low or moderately low water-holding capacity. The Gilpin soil is not so readily leached as the Dekalb and Ramsey soils, and it is not so droughty.

These soils are suited to orchardgrass, reed canarygrass, birdsfoot trefoil, and other grasses and legumes that grow well under somewhat droughty conditions.

Follow a row crop with 4 years or more of hay. When reseeding old, nonproductive hayfields, farm on the contour or use field strips across the main slope. Construct diversion terraces on the long, gentle to moderate slopes

that contribute surface water to these soils. Keep drainageways in a sod that can withstand concentrated flow of water, and topdress the sod with lime and fertilizer.

### *Capability unit IVe–2*

In this unit are sloping, moderately deep, well-drained, moderately fine textured Upshur and Gilpin soils, which are on the uplands. Some areas are severely eroded, and gullies have cut down to bedrock. Much or all of the original surface layer has washed away. Consequently, the plow layer consists mostly of former subsoil, which is sticky, plastic, and slowly permeable. The plow layer, accordingly, puddles easily and is difficult to till. It shrinks and cracks when it dries.

The moderately high natural fertility of these soils is offset by their moderately low water-holding capacity and the poor tilth of the surface layer. These soils are unstable and slip or slide if saturated when the vegetative cover is poor.

These soils are suited to hay and pasture. They need close-growing vegetation because they are among the most erodible soils in the county. If adequately limed and fertilized, they are well suited to alfalfa.

Follow a row crop with 4 years or more of hay. In reseeding hayfields, use contour or field strips. Use diversions in long, sloping fields. Construct diversions beyond the head of active gullies or rills. Establish bluegrass, reed canarygrass, or other strong, close-growing grass in active rills, in gullies, and in poorly sodded drainageways. Topdress the grass with lime and fertilizer. Do not disturb well-established sod in drainageways when renovating. To avoid compacting the soil, restrict grazing and the use of farm machinery when the soil is wet.

### *Capability unit IVe–3*

This unit consists of very shallow to moderately deep, well-drained, medium-textured Gilpin and Weikert soils, which are on uplands. These soils have a shaly or very shaly surface layer. Some are sloping, and others are moderately steep. The moderately steep soils are less eroded than the sloping soils, and the sloping soils are more droughty than the moderately steep soils, because they have lost most or all of their original surface layer. Consequently, both the sloping and the moderately steep soils have the same low potential for crop production.

These soils are low in fertility, and they are strongly acid. They have a fair capacity for holding and releasing plant nutrients, and a low or very low capacity for holding water during the growing season. Rainwater percolates through these soils at a rapid or moderately rapid rate.

Hay and pasture are suitable uses for these soils. Orchardgrass or reed canarygrass and birdsfoot trefoil remain productive longer than most of the other locally grown grasses and legumes. Corn and potatoes are low-yielding crops, especially in a year of little rainfall.

Follow a row crop with 4 years or more of hay. Use contour strips or field strips when reseeding hayland. Use diversions on very long slopes. Establish a close-growing sod crop in drainageways, and topdress it with lime and fertilizer. Lift tillage implements when crossing drainageways, to avoid damaging the sod.

### *Capability unit IVe–4*

This unit consists of a moderately well drained or somewhat poorly drained, medium-textured Guernsey soil, which is on the uplands. Most of the original surface layer of this soil has washed away, and the present plow layer consists of organic matter stained clayey material from the subsoil.

Natural fertility is moderate in this soil. The capacity for holding and releasing plant nutrients is good, but the capacity for holding water has been reduced by the loss of the original surface layer. Water moves slowly through the lower part of the subsoil, and consequently the plow layer is wet late in spring.

This soil is well suited to hay or pasture grasses and legumes that can withstand wetness. Birdsfoot trefoil is better suited than alfalfa for perennial hay.

Follow a row crop with 4 years or more of hay. Reseed nonproductive stands of hay in strips across the slope. Install tile drains in seepage areas. Construct diversions on long slopes and at the head of active rills and gullies. Establish a strong sod in gullies and drainageways, and maintain it by topdressing with lime and fertilizer and by mowing.

### *Capability unit IVe–5*

The soils in this unit, sloping and moderately steep Ernest and Wharton soils, are medium textured, deep, and moderately well drained or somewhat poorly drained. They are on uplands and valley slopes. The sloping soils have lost most of their original surface layer through erosion and are dissected by rills and gullies. The moderately steep soils occur mainly as narrow strips, and they too have lost much of their original surface layer.

The water-holding capacity of the soils in this unit is moderate, natural fertility is low or moderately low, and the reaction is strongly acid or very strongly acid. The water table is high because water moves slowly through the lower part of the subsoil.

These soils are well suited to hay and pasture, particularly to grasses and legumes that tolerate wetness. Birdsfoot trefoil is better suited than alfalfa for long-time hay.

Follow a cultivated crop with 4 years or more of hay. Reseed nonproductive stands of hay and pasture in strips across the slope. Install tile drains in seepage areas and other wet spots. Construct diversions on long slopes. Establish a fibrous-rooted, close-growing sod in drainageways and gullies, and maintain it by topdressing with lime and fertilizer and by mowing.

### *Capability unit IVe–6*

In this unit are sloping and moderately steep, medium-textured, somewhat poorly drained Cavode soils, which are on the uplands. The sloping soils have lost most or all of their original surface layer through erosion, and the moderately steep soils have lost much of theirs.

These soils are low in natural fertility and are very strongly acid. They have a moderate water-holding capacity and a good capacity for holding and releasing plant nutrients. They have a seasonal high water table because of slow permeability in their subsoil and substratum.

These soils are well suited to hay and pasture, particularly to grasses and legumes that tolerate wetness. Timothy and birdsfoot trefoil are better suited than smooth brome and alfalfa.

Follow a cultivated crop with 4 years or more of hay. Reseed hayland in strips across the slope. Install tile drains wherever wet-weather springs occur. Construct diversions on long slopes and at the head of gullies. Establish a fibrous-rooted, close-growing sod crop, such as bluegrass, in drainageways and gullies, and maintain it by topdressing with lime and fertilizer and by mowing.

### *Capability unit IVw-1*

This unit consists of deep or moderately deep, poorly drained or very poorly drained Armagh, Brinkerton, Nolo, and Purdy soils. These soils are level or nearly level and occur on uplands, terraces, and valley slopes. The Brinkerton and Purdy soils generally are adversely affected by runoff and seepage from adjacent slopes.

The soils in this unit are moderate to low in natural fertility and are strongly acid or very strongly acid. They are slowly permeable below their surface layer, and are commonly waterlogged in spring and late in fall. They have a moderate or moderately high water-holding capacity.

These soils are well suited to hay, pasture, and woodland. Timothy, reed canarygrass, birdsfoot trefoil, and Ladino clover grow well if the soils are sufficiently drained and adequately limed and fertilized. A cultivated crop can be grown for 1 year following 4 years or more of hay.

Construct outlets to remove excess surface water. Install an open drainage system in large, nearly level areas. Use tile drains, backfilled with permeable materials, to supplement open drains where grade and cover are sufficient. To intercept runoff from adjacent slopes, construct diversion terraces at the base of the slopes.

### *Capability unit IVw-2*

In this unit are deep or moderately deep, poorly drained or very poorly drained Armagh, Brinkerton, and Nolo soils. These soils are gently sloping and occur on uplands, terraces, and valley slopes.

The soils are moderate to low in natural fertility and strongly acid or very strongly acid. They have a moderate or moderately high water-holding capacity. Water moves slowly through the subsoil and substratum and stands on the surface in spring and late in fall.

These soils are well suited to hay, pasture, and trees. Timothy, reed canarygrass, birdsfoot trefoil, and Ladino clover are adapted to these wet soils. A cultivated crop can be grown for 1 year following 4 years or more of hay. Artificial drainage is necessary if these soils are cultivated.

Construct diversion terraces on long, gentle slopes, and provide outlets so that drainage water runs into well-stabilized drainageways. Use tile, backfilled with permeable materials, to drain low spots and seeps between the diversion terraces. To intercept runoff from adjacent slopes, construct diversion terraces at the base of the slopes.

### *Capability unit IVs-1*

This unit consists of Strip mine spoil that has been sufficiently smoothed and cleared of stone fragments to permit the use of farm equipment. The spoil is low in pyrites, which adversely affect plant growth.

If adequately limed and fertilized and otherwise well managed, this spoil is suited to hay and pasture. Manure and other organic materials help to increase the water-holding capacity.

To establish and maintain hayland, seed birdsfoot trefoil and timothy in bands, or strips, preferably in spring. Check lime and fertilizer requirements each year until the alkalinity or acidity is stabilized, and test the soil every 3 years thereafter.

### *Capability unit IVs-2*

Areas of Made land, a miscellaneous land type, make up this unit. In these areas the original soil has been covered or destroyed by earth-moving operations, but is not beyond reclamation. If adequately limed and fertilized and otherwise well managed, it can be restored to productivity and used for hay.

To establish and maintain hay, apply manure or other organic material, if available; seed birdsfoot trefoil and timothy in bands, or strips, preferably in spring; and topdress the established stand with lime and fertilizer.

### *Capability unit VIe-1*

In this unit is a steep, shallow to moderately deep, well-drained, medium-textured Westmoreland soil, which is on uplands. This soil has lost most or all of its original surface layer through erosion. Small gullies and rills are common in some areas. Natural fertility is moderate, and the capacity for holding and releasing plant nutrients is good.

This soil is well suited to hay and pasture. All the local grasses and legumes grow well. Birdsfoot trefoil makes good pasture.

Reseed pastures in contour strips. Construct diversion terraces on the long, gentle to moderate slopes that adjoin this soil. Rotate grazing of the large areas. Establish a fibrous-rooted, close-growing sod crop in drainageways and gullies.

### *Capability unit VIe-2*

In this unit are moderately steep, moderately fine textured, moderately deep, well-drained Upshur and Gilpin soils. These soils are on uplands. They have lost most or all of their original surface layer through erosion. Gullies and rills are common in many areas, and there is evidence of slipping and sliding in some places. The water-holding capacity is moderately low or low.

These soils are suited to pasture and woodland. Birdsfoot trefoil and orchardgrass or reed canarygrass make good tall-grass pasture. Gullied areas should be planted to trees. White pine and Austrian pine are suitable.

Reseed these soils in contour strips, especially the long slopes and areas where runoff from adjacent slopes is a hazard. Divide large pastures into small grazing units. To avoid compacting the soil, restrict grazing when the soil is wet. Mow pastures to reduce competition from weeds.

### *Capability unit VIe-3*

This unit consists of very shallow to moderately deep, well-drained, shaly or very shaly Gilpin and Weikert soils, which are on uplands. Some of these soils are moderately steep, and others are steep. The moderately steep soils are severely eroded and have lost most or all of their original surface soil through erosion; the plow cuts shale in some places. The steep soils are only moderately eroded, but they are shallow and droughty. Both the moderately steep and the steep soils are low in natural fertility and are strongly acid.

Pasture and woodland are suitable uses for these soils. Orchardgrass, reed canarygrass, birdsfoot trefoil, or other drought-resistant grasses and legumes make the best pasture, and white pine and Austrian pine are suitable trees.

Reseed pastures in strips across the slope. Divide large pastures into small units for rotation grazing. Apply manure before renovation to produce mulch and increase the water-holding capacity. Mow pastures to reduce competition from weeds.

### *Capability unit VIw-1*

In this unit is a nearly level, deep, poorly drained Atkins soil. This soil is on narrow flood plains and is frequently flooded. Furthermore, the surface layer is wet most of the year because the water table is high.

This soil is strongly acid and is moderately high in natural fertility. It has moderately high water-holding capacity.

This soil is suited to dry-season pasture or to woodland because floods are too frequent to permit effective drainage for crops or tall-grass pasture. Small areas along the larger streams, however, are seldom or only occasionally flooded and, therefore, can be drained and used for crops or hay.

Remove weeds and brush by mowing to improve forage production. Wherever practical, dig ditches to lower the water table to the normal level of the adjacent stream. Consider installing tile drains or constructing diversion terraces at the base of adjacent slopes to reduce runoff and seepage and thereby reduce wetness in the surface layer.

### *Capability unit VIs-1*

This unit consists of the deep, well-drained to somewhat poorly drained, very stony Clymer, Cookport, and Ernest soils. These soils are level to moderately steep and occur on uplands and valley slopes.

These soils are low or moderately low in natural fertility and are strongly acid or very strongly acid. They have a moderate or moderately high water-holding capacity. The Ernest and Cookport soils have moderately slow permeability in the lower part of their subsoil and, consequently, are wet in spring.

Pasture and woodland are suitable for these soils. The number and size of sandstone fragments scattered on the surface generally make impractical the operation of farm equipment. These soils are good or excellent for timber production. Therefore, any conversion of present woodland to pasture should be carefully considered.

For extensive pasture use, remove most of the trees and enough stones and boulders to permit mowing and the application of lime and fertilizer.

### *Capability unit VIs-2*

Making up this unit are shallow to moderately deep, well-drained, very stony Dekalb, Gilpin, and Ramsey soils. These soils are level to moderately steep and occur on uplands. They are low in natural fertility and are strongly acid or very strongly acid. Their water-holding capacity is moderately low or low.

These soils are suited mainly to extensive use as pasture and woodland. They are fair or good for timber production. The sandstone fragments scattered on the surface generally make impractical the operation of farm equipment.

For extensive pasture use, remove enough stones and boulders to permit the use of equipment for mowing and for topdressing with lime and fertilizer. Remove most of the trees from woodland pastures, so the grasses and legumes will get more sunlight and moisture.

### *Capability unit VIs-3*

In this unit are somewhat poorly drained, very stony Cavode soils. These soils are level or moderately steep and occur on uplands. They have a slowly permeable subsoil and substratum and consequently are seasonally waterlogged. Their surface layer is easily compacted. Natural fertility is low, and the reaction is very strongly acid.

These soils are suited mainly to pasture and woodland. Most areas are too stony for tall-grass pasture but are good for timber.

For extensive pasture use, remove enough stones and boulders to permit topdressing and mowing. Topdress with lime and fertilizer. Remove most of the trees in woodland pastures, so the grasses and legumes will get more sunlight and moisture. Keep livestock off the pasture when the soils are saturated, to avoid compaction and erosion.

### *Capability unit VIIe-1*

This unit consists of shallow to moderately deep, well-drained, steep or very steep Gilpin, Weikert, Ramsey, and Dekalb soils, which are on uplands. These soils have a moderately low or low water-holding capacity.

These soils are suitable for woodland, wildlife, and watersheds. They are fair for timber.

### *Capability unit VIIe-2*

In this unit are steep or very steep, shallow or very shallow, well-drained Upshur, Gilpin, and Weikert soils, which are on uplands. Except in some wooded areas, these soils are either moderately eroded or severely eroded. They have a low or very low water-holding capacity.

These soils have little value as commercial timberland but can be used for the production of Christmas trees, pulpwood, mine props, and fenceposts. For the more remote areas, suitable uses are for wildlife habitats and watersheds.

### *Capability unit VIIs-1*

This unit consists of shallow to moderately deep, well-drained Dekalb, Gilpin, Ramsey, and Weikert soils, which

are on uplands. These soils are steep or very steep and very stony. They have a low or moderately low water-holding capacity. They are only fairly well suited to timber production. Logging is difficult and hazardous. Remote areas are suitable for wildlife and watersheds.

### *Capability unit VIIs-2*

In this unit are deep or moderately deep, poorly drained or very poorly drained, very stony Brinkerton soils. These soils are level to gently sloping and occur on uplands and valley slopes. Slow permeability in the subsoil or continual seepage keeps these soils waterlogged most of the year.

The high cost of drainage and of removing the many large stones encourages continued use of these soils for woodland and wildlife. These soils are fairly well suited to timber production. The level or nearly level areas are suitable sites for wildlife ponds.

Most of the trees on these soils are shallow rooted. Therefore, cutting should be according to single-tree selection, in order to limit the windthrow hazard.

### *Capability unit VIIs-3*

This unit consists mainly of sloping and steep Strip mine spoil but includes some level to moderately sloping areas that have numerous sandstone or flagstone fragments or that have rough, uneven relief. It also includes some level to moderately sloping areas that are high in pyrites. Farm machinery cannot be used in the steep, rough, or stony areas; and plant growth is adversely affected by pyritic material.

The suitability for timber production varies. Nevertheless, trees can help to stabilize these areas so that the runoff hazard will be less severe. Runoff has caused much damage to the slopes below the areas of spoil. White pine, larch, and black locust generally are suitable for planting. Birdsfoot trefoil or crownvetch and tall fescue or tall oatgrass, seeded with the trees, provide ground cover and help to stabilize the areas.

### *Capability unit VIIIs-1*

In this unit are miscellaneous land types that do not support crops, pasture, or forests under economical and practical management.

Made land consists of areas that are a result of earthmoving operations. Most or all of the soil material has been removed, and hard shale or sandstone is at the surface. To establish vegetation in these areas, add soil material or some other material that provides a medium for plant growth, and seed to drought-tolerant plants (fig. 9).

Mine dumps are waste piles of low-grade coal, carbonaceous shale, cinders, and ashes. These waste ma-

***Figure 9.*—A thrifty stand of crownvetch has been established on the deep Monongahela soil in the upper part of the steep roadbank. The lower part of the roadbank consists of hard shale and, therefore, needs expensive amendments for successful vegetation. Hard shale lacks water-holding materials, and consequently young germinating plants die.**

TABLE 1.—*Estimated*

[Ratings in columns A determined on basis of common management, and those in columns B on basis of improved management; absence generally not used

| Map symbol | Soil | Corn for grain (100=75 bu. per acre) | | Corn for silage (100=15 tons per acre) | | Oats (100=60 bu. per acre) | |
|---|---|---|---|---|---|---|---|
| | | A | B | A | B | A | B |
| AhA | Allegheny silt loam, 0 to 3 percent slopes | 86 | 152 | 86 | 152 | 67 | 120 |
| AhB2 | Allegheny silt loam, 3 to 8 percent slopes, moderately eroded | 83 | 146 | 65 | 146 | 62 | 113 |
| AhC2 | Allegheny silt loam, 8 to 15 percent slopes, moderately eroded | 77 | 140 | 77 | 140 | 55 | 105 |
| ArA | Armagh silt loam, 0 to 3 percent slopes | ---------- | 73 | 27 | 73 | ---------- | 58 |
| ArB2 | Armagh silt loam, 3 to 8 percent slopes, moderately eroded | ---------- | 84 | 33 | 84 | ---------- | 72 |
| At | Atkins silt loam | ---------- | 133 | 67 | 133 | ---------- | 83 |
| BkA | Brinkerton silt loam, 0 to 3 percent slopes | ---------- | 93 | 47 | 93 | ---------- | 67 |
| BkB2 | Brinkerton silt loam, 3 to 8 percent slopes, moderately eroded | ---------- | 100 | 53 | 100 | ---------- | 80 |
| BnA | Brinkerton silt loam, very wet, 0 to 3 percent slopes | ---------- | 67 | ---------- | 67 | ---------- | ---------- |
| BnB | Brinkerton silt loam, very wet, 3 to 8 percent slopes | ---------- | 80 | ---------- | 80 | ---------- | ---------- |
| BsB | Brinkerton very stony silt loam, 0 to 8 percent slopes | ---------- | ---------- | ---------- | ---------- | ---------- | ---------- |
| CaA | Cavode silt loam, 0 to 3 percent slopes | 53 | 100 | 53 | 100 | 50 | 83 |

See footnote at end of table.

terials generally have a dark-colored surface layer, are extremely acid, and have a very low water-holding capacity. Tender, young plants are not easily established in these materials, because in a long, hot summer the temperature of the surface layer is so high. In most places, little has been done to stabilize these mine dumps, though their stability is important to watershed protection. Quaking aspen grows naturally in these areas. Generally, the trees start growing at the base of the dump, then spread up the sides.

Stony land consists of sloping and steep areas that are mostly wooded. Harvesting timber in these areas is not economical, mostly because of steep slopes and rock outcrops. A good vegetative cover is necessary, and management that guards against fire, disease, and destructive cutting is needed.

The Strip mine spoil in this unit includes high walls, extremely stony areas where it is difficult to plant trees, and areas high in pyritic materials, or sulfur-bearing minerals. Planting honeysuckle or other vines at the top and bottom of high walls is one way to stabilize these places. Black locust, autumn olive, tall oatgrass, and sericea lespedeza can be seeded in extremely stony areas where the reaction is pH 4.0 or higher. Planting or seeding spoil that is toxic or that is high in pyritic materials should be delayed until the reaction is pH 4.0 or higher.

## Productivity Ratings of the Soils

Table 1 gives estimated productivity ratings for those soils in Indiana County that are suited to the principal field and pasture crops grown in the county. Some very wet, very stony, or very steep soils, therefore, are excluded. Miscellaneous land types also are excluded, for they generally are not suited to crops or pasture without extensive reclamation.

The rating given to a soil for a specified crop is a percentage of the standard yield, 100 or 100 percent, that is shown in the column heading. The standard yield represents the average yield of that particular crop obtained on the best soils in the county under ordinary management.

The ratings in table 1 can be used to estimate the yield of a given crop on any soil listed in the table, provided the soil is suited to the crop. For example, Allegheny silt loam, 0 to 3 percent slopes, is given a rating of 86 percent for corn grown under A level management, and a rating of 152 percent for the same crop grown under B level management. The corn yield under A level management is 86 percent of 75 bushels, which is the standard yield, or 65 bushels per acre. Similarly, the corn yield under B level management is 152 percent of 75 bushels, or 114 bushels per acre.

The estimates of yields obtained by use of the productivity ratings represent averages that can be expected over several years. In any year, yields may be affected by plant diseases, insects, favorable or unfavorable weather, or other factors.

The figure in the columns A show the percentage of the standard yield that can be expected under common or ordinary management. Those in the columns B show the percentage of the standard yield that can be obtained under improved management, which includes such practices as liming and fertilizing the soils in amounts indicated by soil tests; applying manure; choosing the right crop and cropping system; utilizing crop residue properly; draining excess water; preparing a proper seedbed; controlling plant diseases, insects, weeds, and brush; taking measures to control runoff and thereby reduce erosion; and, in pastures, regulating grazing.

Comparison of figures in columns A and B shows the response that can be expected under improved management. Several years may pass before yields are consistently higher as a result of improved management.

*productivity ratings*

of a rating indicates soil is not suited to the crop or is not commonly used for the crop; soils and miscellaneous land types not listed are for crops or pasture]

| Wheat (100=30 bu. per acre) | | Hay (clover and grass or trefoil and grass) (100=3 tons per acre) | | Hay (alfalfa and grass) (100=3 tons per acre) | | Permanent pasture (100=80 cow-acre-days [1]) | | Tall-grass pasture (100=140 cow-acre-days [1]) | |
|---|---|---|---|---|---|---|---|---|---|
| A | B | A | B | A | B | A | B | A | B |
| 83 | 133 | 67 | 113 | 83 | 133 | 62 | 119 | 64 | 121 |
| 77 | 123 | 60 | 110 | 73 | 133 | 60 | 115 | 63 | 120 |
| 70 | 120 | 57 | 103 | 67 | 126 | 57 | 112 | 60 | 116 |
| 37 | 70 | 30 | 60 | ---------- | ---------- | 35 | 67 | 40 | 77 |
| 43 | 100 | 35 | 73 | ---------- | ---------- | 41 | 82 | 47 | 94 |
| ---------- | 117 | 73 | 100 | ---------- | ---------- | 81 | 113 | 93 | 118 |
| 40 | 83 | 40 | 67 | ---------- | ---------- | 42 | 70 | 48 | 84 |
| 50 | 100 | 43 | 77 | ---------- | ---------- | 50 | 82 | 57 | 96 |
| ---------- | ---------- | 23 | 47 | ---------- | ---------- | 31 | 62 | 36 | 71 |
| ---------- | ---------- | 33 | 66 | ---------- | ---------- | 44 | 87 | 50 | 100 |
| ---------- | ---------- | ---------- | ---------- | ---------- | ---------- | 45 | ---------- | ---------- | ---------- |
| 50 | 90 | 43 | 77 | 33 | 60 | 42 | 85 | 46 | 89 |

TABLE 1.—*Estimated*

| Map symbol | Soil | Corn for grain (100=75 bu. per acre) | | Corn for silage (100=15 tons per acre) | | Oats (100=60 bu. per acre) | |
|---|---|---|---|---|---|---|---|
| | | A | B | A | B | A | B |
| CaB2 | Cavode silt loam, 3 to 8 percent slopes, moderately eroded | 60 | 107 | 60 | 107 | 63 | 88 |
| CaC2 | Cavode silt loam, 8 to 15 percent slopes, moderately eroded | 56 | 100 | 56 | 100 | 63 | 83 |
| CaD2 | Cavode silt loam, 15 to 25 percent slopes, moderately eroded | 47 | 88 | 47 | 88 | 50 | 73 |
| CcC3 | Cavode silty clay loam, 8 to 15 percent slopes, severely eroded | 47 | 88 | 47 | 88 | 50 | 72 |
| CdB | Cavode very stony silt loam, 0 to 8 percent slopes | -- | -- | -- | -- | -- | -- |
| CdC | Cavode very stony silt loam, 8 to 25 percent slopes | -- | -- | -- | -- | -- | -- |
| CkB2 | Clarksburg silt loam, 3 to 8 percent slopes, moderately eroded | 100 | 146 | 100 | 146 | 75 | 107 |
| CkC2 | Clarksburg silt loam, 8 to 15 percent slopes, moderately eroded | 89 | 130 | 89 | 130 | 67 | 108 |
| C1A2 | Clymer channery loam, 0 to 5 percent slopes, moderately eroded | 86 | 146 | 86 | 146 | 63 | 107 |
| C1B2 | Clymer channery loam, 5 to 12 percent slopes, moderately eroded | 80 | 140 | 80 | 140 | 62 | 113 |
| C1C2 | Clymer channery loam, 12 to 20 percent slopes, moderately eroded | 67 | 127 | 67 | 127 | 55 | 105 |
| CmB | Clymer very stony loam, 0 to 12 percent slopes | -- | -- | -- | -- | -- | -- |
| CmD | Clymer very stony loam, 12 to 35 percent slopes | -- | -- | -- | -- | -- | -- |
| CoA | Cookport loam, 0 to 3 percent slopes | 59 | 107 | 59 | 107 | 42 | 83 |
| CoB2 | Cookport loam, 3 to 8 percent slopes, moderately eroded | 63 | 114 | 63 | 114 | 50 | 92 |
| CoC2 | Cookport loam, 8 to 15 percent slopes, moderately eroded | 55 | 107 | 55 | 107 | 47 | 86 |
| CpB | Cookport very stony loam, 0 to 8 percent slopes | -- | -- | -- | -- | -- | -- |
| CpC | Cookport very stony loam, 8 to 25 percent slopes | -- | -- | -- | -- | -- | -- |
| DaA2 | Dekalb channery sandy loam, 0 to 5 percent slopes, moderately eroded | 64 | 107 | 64 | 107 | 58 | 92 |
| DaB2 | Dekalb channery sandy loam, 5 to 12 percent slopes, moderately eroded | 59 | 99 | 59 | 99 | 55 | 87 |
| DaC2 | Dekalb channery sandy loam, 12 to 20 percent slopes, moderately eroded | 50 | 91 | 50 | 91 | 50 | 83 |
| DbB | Dekalb very stony sandy loam, 0 to 12 percent slopes | -- | -- | -- | -- | -- | -- |
| DgB | Dekalb-Gilpin very stony loams, 0 to 12 percent slopes | -- | -- | -- | -- | -- | -- |
| DgD | Dekalb-Gilpin very stony loams, 12 to 35 percent slopes | -- | -- | -- | -- | -- | -- |
| DkD2 | Dekalb and Ramsey channery sandy loams, 20 to 35 percent slopes, moderately eroded | -- | 66 | 35 | 66 | 35 | 70 |
| DrD | Dekalb and Ramsey very stony sandy loams, 12 to 35 percent slopes | -- | -- | -- | -- | -- | -- |
| ErA2 | Ernest silt loam, 0 to 3 percent slopes, moderately eroded | 73 | 133 | 73 | 133 | 58 | 100 |
| ErB2 | Ernest silt loam, 3 to 8 percent slopes, moderately eroded | 80 | 125 | 80 | 125 | 63 | 105 |
| ErB3 | Ernest silt loam, 3 to 8 percent slopes, severely eroded | 67 | 113 | 67 | 113 | 50 | 83 |
| ErC2 | Ernest silt loam, 8 to 15 percent slopes, moderately eroded | 70 | 117 | 70 | 117 | 53 | 87 |
| ErC3 | Ernest silt loam, 8 to 15 percent slopes, severely eroded | 53 | 100 | 53 | 100 | 43 | 73 |
| ErD2 | Ernest silt loam, 15 to 25 percent slopes, moderately eroded | 56 | 103 | 56 | 103 | 43 | 77 |
| EsB | Ernest very stony silt loam, 0 to 8 percent slopes | -- | -- | -- | -- | -- | -- |
| EsC | Ernest very stony silt loam, 8 to 25 percent slopes | -- | -- | -- | -- | -- | -- |
| GcA2 | Gilpin channery silt loam, 0 to 5 percent slopes, moderately eroded | 73 | 120 | 73 | 120 | 67 | 100 |
| GcB2 | Gilpin channery silt loam, 5 to 12 percent slopes, moderately eroded | 67 | 113 | 67 | 113 | 63 | 95 |
| GcC2 | Gilpin channery silt loam, 12 to 20 percent slopes, moderately eroded | 59 | 101 | 59 | 101 | 58 | 92 |
| GcD2 | Gilpin channery silt loam, 20 to 35 percent slopes, moderately eroded | 40 | 77 | 40 | 77 | 40 | 73 |
| GnB | Gilpin very stony silt loam, 0 to 12 percent slopes | -- | -- | -- | -- | -- | -- |
| GnD | Gilpin very stony silt loam, 12 to 35 percent slopes | -- | -- | -- | -- | -- | -- |
| GpE2 | Gilpin and Weikert channery silt loams, 35 to 70 percent slopes, moderately eroded | -- | -- | -- | -- | -- | -- |

See footnote at end of table.

*productivity ratings*—Continued

| Wheat (100=30 bu. per acre) | | Hay (clover and grass or trefoil and grass) (100=3 tons per acre) | | Hay (alfalfa and grass) (100=3 tons per acre) | | Permanent pasture (100=80 cow-acre-days [1]) | | Tall-grass pasture (100=140 cow-acre-days [1]) | |
|---|---|---|---|---|---|---|---|---|---|
| A | B | A | B | A | B | A | B | A | B |
| 60 | 100 | 43 | 87 | 35 | 70 | 49 | 92 | 53 | 100 |
| 50 | 94 | 43 | 83 | 35 | 70 | 46 | 87 | 51 | 94 |
| 43 | 87 | 33 | 66 | 33 | 65 | 44 | 81 | 50 | 94 |
| 43 | 87 | 35 | 73 | 30 | 60 | 41 | 78 | 47 | 93 |
| ---------- | ---------- | ---------- | ---------- | ---------- | ---------- | 44 | ---------- | ---------- | ---------- |
| ---------- | ---------- | ---------- | ---------- | ---------- | ---------- | 38 | ---------- | ---------- | ---------- |
| 87 | 123 | 73 | 126 | 83 | 133 | 75 | 125 | 79 | 129 |
| 80 | 120 | 67 | 113 | 80 | 126 | 70 | 120 | 71 | 121 |
| 83 | 133 | 67 | 113 | 83 | 133 | 62 | 119 | 64 | 121 |
| 77 | 123 | 60 | 110 | 73 | 133 | 60 | 115 | 63 | 120 |
| 70 | 120 | 57 | 103 | 67 | 126 | 57 | 112 | 60 | 116 |
| ---------- | ---------- | ---------- | ---------- | ---------- | ---------- | 60 | ---------- | ---------- | ---------- |
| ---------- | ---------- | ---------- | ---------- | ---------- | ---------- | 52 | ---------- | ---------- | ---------- |
| 53 | 100 | 50 | 93 | 33 | 73 | 57 | 106 | 58 | 110 |
| 60 | 113 | 57 | 103 | 40 | 83 | 57 | 110 | 68 | 113 |
| 55 | 110 | 54 | 97 | 40 | 83 | 56 | 106 | 57 | 110 |
| ---------- | ---------- | ---------- | ---------- | ---------- | ---------- | 50 | ---------- | ---------- | ---------- |
| ---------- | ---------- | ---------- | ---------- | ---------- | ---------- | 44 | ---------- | ---------- | ---------- |
| 60 | 110 | 50 | 97 | 65 | 116 | 50 | 97 | 54 | 106 |
| 55 | 94 | 47 | 93 | 60 | 113 | 49 | 95 | 51 | 102 |
| 47 | 80 | 43 | 90 | 57 | 106 | 46 | 91 | 48 | 99 |
| ---------- | ---------- | ---------- | ---------- | ---------- | ---------- | 25 | ---------- | ---------- | ---------- |
| ---------- | ---------- | ---------- | ---------- | ---------- | ---------- | 31 | ---------- | ---------- | ---------- |
| ---------- | ---------- | ---------- | ---------- | ---------- | ---------- | 25 | ---------- | ---------- | ---------- |
| 37 | 60 | 35 | 83 | 54 | 90 | 35 | 70 | 43 | 90 |
| ---------- | ---------- | ---------- | ---------- | ---------- | ---------- | 19 | ---------- | ---------- | ---------- |
| 67 | 113 | 57 | 100 | 54 | 90 | 57 | 106 | 58 | 110 |
| 74 | 113 | 60 | 106 | 57 | 97 | 57 | 110 | 58 | 113 |
| 53 | 94 | 50 | 93 | 47 | 83 | 52 | 100 | 54 | 106 |
| 60 | 100 | 54 | 100 | 50 | 87 | 56 | 104 | 52 | 110 |
| 47 | 87 | 47 | 93 | 43 | 80 | 50 | 97 | 51 | 103 |
| 50 | 94 | 50 | 93 | 47 | 83 | 52 | 100 | 53 | 106 |
| ---------- | ---------- | ---------- | ---------- | ---------- | ---------- | 57 | ---------- | ---------- | ---------- |
| ---------- | ---------- | ---------- | ---------- | ---------- | ---------- | 52 | ---------- | ---------- | ---------- |
| 73 | 113 | 54 | 100 | 67 | 120 | 54 | 101 | 58 | 109 |
| 67 | 106 | 50 | 97 | 65 | 116 | 51 | 99 | 55 | 106 |
| 3 | 94 | 47 | 93 | 60 | 113 | 49 | 95 | 52 | 102 |
| 43 | 70 | 40 | 87 | 57 | 106 | 37 | 75 | 44 | 92 |
| ---------- | ---------- | ---------- | ---------- | ---------- | ---------- | 34 | ---------- | ---------- | ---------- |
| ---------- | ---------- | ---------- | ---------- | ---------- | ---------- | 27 | ---------- | ---------- | ---------- |
| ---------- | ---------- | ---------- | ---------- | ---------- | ---------- | 21 | ---------- | ---------- | ---------- |

TABLE 1.—*Estimated*

| Map symbol | Soil | Corn for grain (100=75 bu. per acre) | | Corn for silage (100=15 tons per acre) | | Oats (100=60 bu. per acre) | |
|---|---|---|---|---|---|---|---|
| | | A | B | A | B | A | B |
| GwA2 | Gilpin-Weikert shaly silt loams, 0 to 5 percent slopes, moderately eroded | 43 | 80 | 43 | 80 | 43 | 80 |
| GwB2 | Gilpin-Weikert shaly silt loams, 5 to 12 percent slopes, moderately eroded | 40 | 74 | 40 | 74 | 40 | 77 |
| GwC2 | Gilpin-Weikert shaly silt loams, 12 to 20 percent slopes, moderately eroded | | 61 | 35 | 61 | 33 | 67 |
| GyB2 | Guernsey silt loam, 3 to 8 percent slopes, moderately eroded | 93 | 136 | 93 | 136 | 67 | 108 |
| GyC3 | Guernsey silt loam, 8 to 15 percent slopes, severely eroded | 60 | 100 | 60 | 100 | 50 | 92 |
| MoA2 | Monongahela silt loam, 0 to 3 percent slopes, moderately eroded | 67 | 126 | 67 | 126 | 53 | 90 |
| MoB2 | Monongahela silt loam, 3 to 8 percent slopes, moderately eroded | 69 | 133 | 69 | 133 | 57 | 97 |
| MoC2 | Monongahela silt loam, 8 to 15 percent slopes, moderately eroded | 67 | 126 | 67 | 126 | 53 | 90 |
| NoA | Nolo silt loam, 0 to 3 percent slopes | | 80 | 24 | 80 | | 58 |
| NoB | Nolo silt loam, 3 to 8 percent slopes | | 86 | 28 | 86 | | 75 |
| Ph | Philo silt loam | 113 | 160 | 113 | 160 | 83 | 117 |
| Pm | Pope fine sandy loam | 113 | 160 | 113 | 160 | 83 | 117 |
| Po | Pope silt loam | 120 | 167 | 120 | 167 | 92 | 125 |
| PuA | Purdy silt loam, 0 to 5 percent slopes | | 80 | 24 | 80 | | 58 |
| RcE | Ramsey and Dekalb channery sandy loams, 35 to 70 percent slopes | | | | | | |
| TrA | Tygart silt loam, 0 to 3 percent slopes | 53 | 100 | 53 | 100 | 50 | 83 |
| TrB2 | Tygart silt loam, 3 to 8 percent slopes, moderately eroded | 60 | 107 | 60 | 107 | 63 | 88 |
| UgB2 | Upshur-Gilpin silty clay loams, 3 to 8 percent slopes, moderately eroded | 73 | 126 | 73 | 126 | 50 | 83 |
| UgC2 | Upshur-Gilpin silty clay loams, 8 to 15 percent slopes, moderately eroded | 67 | 113 | 67 | 113 | 42 | 75 |
| UgC3 | Upshur-Gilpin silty clay loams, 8 to 15 percent slopes, severely eroded | | | | | 33 | 67 |
| UgD2 | Upshur-Gilpin silty clay loams, 15 to 25 percent slopes, moderately eroded | | | | | 33 | 67 |
| UgD3 | Upshur-Gilpin silty clay loams, 15 to 25 percent slopes, severely eroded | | | | | | |
| UgE3 | Upshur-Gilpin silty clay loams, 25 to 45 percent slopes, severely eroded | | | | | | |
| VaB2 | Vandergrift silt loam, 3 to 8 percent slopes, moderately eroded | 86 | 140 | 86 | 140 | 70 | 110 |
| VaC2 | Vandergrift silt loam, 8 to 15 percent slopes, moderately eroded | 80 | 127 | 80 | 127 | 63 | 100 |
| WgB3 | Weikert-Gilpin shaly silt loams, 5 to 12 percent slopes, severely eroded | | 61 | 35 | 61 | 30 | 63 |
| WgC3 | Weikert-Gilpin shaly silt loams, 12 to 20 percent slopes, severely eroded | | | | | 27 | 56 |
| WkD2 | Weikert and Gilpin shaly silt loams, 20 to 35 percent slopes, moderately eroded | | | | | 28 | 56 |
| WkD3 | Weikert and Gilpin shaly silt loams, 20 to 35 percent slopes, severely eroded | | | | | | |
| WmB2 | Westmoreland silt loam, 5 to 12 percent slopes, moderately eroded | 80 | 146 | 80 | 146 | 67 | 100 |
| WmC2 | Westmoreland silt loam, 12 to 20 percent slopes, moderately eroded | 73 | 140 | 73 | 140 | 60 | 92 |
| WmD3 | Westmoreland silt loam, 20 to 35 percent slopes, severely eroded | | | | | 50 | 83 |
| WrA | Wharton silt loam, 0 to 3 percent slopes | 73 | 133 | 73 | 133 | 58 | 100 |
| WrB2 | Wharton silt loam, 3 to 8 percent slopes, moderately eroded | 73 | 140 | 73 | 140 | 67 | 108 |
| WrC2 | Wharton silt loam, 8 to 15 percent slopes, moderately eroded | 67 | 133 | 67 | 133 | 58 | 92 |
| WrC3 | Wharton silt loam, 8 to 15 percent slopes, severely eroded | 60 | 113 | 60 | 113 | 50 | 80 |
| WrD2 | Wharton silt loam, 15 to 25 percent slopes, moderately eroded | 60 | 113 | 60 | 113 | 50 | 83 |

[1] Cow-acre-days represents the number of days per year 1 acre will graze a cow without injury to the pasture.

*productivity ratings*—Continued

| Wheat (100=30 bu. per acre) | | Hay (clover and grass or trefoil and grass) (100=3 tons per acre) | | Hay (alfalfa and grass) (100=3 tons per acre) | | Permanent pasture (100=80 cow-acre-days [1]) | | Tall-grass pasture (100=140 cow-acre-days [1]) | |
|---|---|---|---|---|---|---|---|---|---|
| A | B | A | B | A | B | A | B | A | B |
| 53 | 84 | 47 | 83 | 35 | 73 | 37 | 70 | 43 | 86 |
| 47 | 70 | 43 | 77 | 33 | 70 | 35 | 65 | 40 | 77 |
| 40 | 60 | 35 | 67 | 30 | 60 | 32 | 60 | 36 | 72 |
| 83 | 116 | 73 | 116 | 90 | 133 | 75 | 125 | 75 | 130 |
| 60 | 83 | 67 | 100 | 73 | 100 | 62 | 106 | 64 | 114 |
| 60 | 94 | 54 | 100 | 47 | 87 | 56 | 106 | 57 | 110 |
| 67 | 106 | 57 | 103 | 50 | 93 | 57 | 110 | 60 | 114 |
| 60 | 94 | 54 | 100 | 47 | 87 | 56 | 106 | 52 | 110 |
| -- | 70 | 30 | 60 | -- | -- | 37 | 70 | 40 | 77 |
| -- | 84 | 40 | 73 | -- | -- | 44 | 83 | 50 | 96 |
| 100 | 133 | 93 | 116 | 93 | 133 | 94 | 119 | 96 | 125 |
| 100 | 133 | 93 | 116 | 93 | 140 | 87 | 119 | 93 | 125 |
| 116 | 150 | 100 | 116 | 106 | 145 | 100 | 125 | 100 | 128 |
| -- | 70 | 30 | 60 | -- | -- | 35 | 67 | 40 | 77 |
| -- | -- | -- | -- | -- | -- | 15 | -- | -- | -- |
| 50 | 90 | 43 | 77 | 33 | 60 | 42 | 85 | 46 | 89 |
| 60 | 100 | 43 | 87 | 35 | 70 | 49 | 92 | 53 | 100 |
| 60 | 100 | 54 | 93 | 77 | 120 | 62 | 106 | 57 | 100 |
| 53 | 94 | 50 | 90 | 70 | 113 | 56 | 100 | 54 | 93 |
| 47 | 80 | 43 | 80 | 57 | 97 | 50 | 87 | 43 | 79 |
| 47 | 84 | 47 | 87 | 60 | 100 | 50 | 87 | 43 | 79 |
| -- | -- | 33 | 67 | 33 | 67 | 44 | 75 | 36 | 64 |
| -- | -- | -- | -- | -- | -- | 19 | -- | -- | -- |
| 80 | 120 | 73 | 120 | 83 | 133 | 75 | 125 | 79 | 128 |
| 70 | 110 | 67 | 113 | 80 | 126 | 70 | 120 | 71 | 121 |
| 37 | 53 | 33 | 65 | 27 | 57 | 30 | 55 | 32 | 64 |
| 33 | 47 | 30 | 57 | 23 | 50 | 25 | 48 | 30 | 60 |
| 33 | 47 | 30 | 57 | 23 | 50 | 25 | 48 | 30 | 60 |
| -- | -- | 17 | 33 | 13 | 60 | 13 | 22 | 14 | 29 |
| 80 | 120 | 87 | 133 | 100 | 145 | 75 | 125 | 79 | 128 |
| 73 | 113 | 80 | 126 | 93 | 140 | 69 | 119 | 71 | 121 |
| 60 | 87 | 66 | 113 | 83 | 120 | 57 | 106 | 61 | 116 |
| 67 | 116 | 60 | 100 | 50 | 93 | 57 | 106 | 58 | 110 |
| 73 | 123 | 66 | 106 | 60 | 100 | 57 | 110 | 58 | 114 |
| 67 | 116 | 60 | 100 | 54 | 93 | 56 | 106 | 57 | 110 |
| 50 | 100 | 50 | 90 | 43 | 83 | 50 | 100 | 50 | 100 |
| 50 | 100 | 54 | 93 | 47 | 87 | 52 | 102 | 51 | 103 |

## Woodland [2]

The dense virgin forests that once covered Indiana County have disappeared as a result of repeated cuttings for commercial purposes and land clearing for agricultural use. At present about 42 percent of the county is commercial woodland consisting mainly of poor quality second- and third-growth trees (*17*)[3]. In recent years much abandoned farmland and many idle areas have reverted to forest or have been artificially reforested.

The trees in naturally reforested areas are mostly of inferior species, such as dogwood, sassafras, aspen, red maple, yellow-poplar, and cherry. Generally, these trees have poor form and, except for yellow-poplar, have little value as timber.

In artificially reforested areas, the trees are larch, Douglas-fir, spruce, and pine. Christmas tree plantations and tree nurseries have become important sources of income in the county.

The forest types in Indiana County (*12*) and their proportionate extent (*17*) are as follows:

The *northern red oak type* is mainly on the uplands and covers 72 percent of the commercial woodland in the county. Northern red oak is predominant. Associates, or trees that commonly grow with northern red oak, are black oak, scarlet oak, chestnut oak, and yellow-poplar.

The *sugar maple-beech-yellow birch type* is mainly on the lowlands and covers 15 percent of the total woodland. Associates are basswood, red maple, red oak, white pine, and black cherry.

Other forest types cover the remaining 13 percent of the woodland. These types include a mixture of chestnut oak, red maple, and black birch on the dry sandstone ridges, and hemlock and yellow birch in very wet areas.

Sawtimber makes up about 16 percent of the commercial forest. Poletimber accounts for 52 percent, and seedlings account for 32 percent (*17*). In some large areas, only seedlings, sprouts, and saplings grow; these have little or no economic value. In other areas, many of the harvest-size trees are badly decayed, knotty, or poorly formed.

Most of the soils in this county are favorable for the growth of such timber trees as red oak, black cherry, white pine, and yellow-poplar. Some of the soils, however, like the shallow, dry Weikert shaly silt loam and the very poorly drained Brinkerton silt loam, are poorly suited to timber production.

Under sound woodland management, many areas now in red maple, beech, and birch can support more valuable trees. Technical information is available to help plan management for improvement of the woodland.

Table 2 (p. 26–27) gives information that is essential in planning management for the improvement of woodland. Management of woodland can be planned more effectively if soils are grouped according to those characteristics that affect tree growth. For this reason, the soils in Indiana County have been placed in 18 woodland groups. The miscellaneous land types were not included in the groups, because they generally are not suited to trees, or they are so variable in characteristics that onsite inspection is necessary to determine their potential for tree growth.

The factors considered in placing each soil in a woodland group include (1) potential productivity, (2) species priority for reforestation, and (3) soil-related hazards and limitations that affect woodland management. These factors are explained in the pages that follow.

*Potential productivity* indicates the amount of wood crops a soil can produce under a specified level of management. In table 2, potential productivity for oak is expressed as a site index. A site index is the average height of dominant trees (the tallest trees in the stand) at age 50. Foresters accept a site index as the best readily available indicator of the potential productivity of a soil.

A site index can be converted to a volumetric prediction of growth and yield, and the prediction can be shown in different common units of wood measurements, such as board feet. Estimates of total yield per acre are given in table 2 for oak (*11*).

*Species priority for reforestation* refers to the suitable trees that are listed in table 2. Native species to favor in managing existing woodland and species preferred for planting are listed.

*Soil-related hazards and limitations* to be considered in woodland management are seedling mortality, plant competition, equipment limitations, erosion hazard, and windthrow hazard. These also are given in table 2.

The ratings for seedling mortality refer to the expected loss of naturally occurring or planted seedlings as a result of unfavorable soil characteristics or topographic features, not as a result of plant competition. Seedling mortality is *slight* if the loss is less than 25 percent. It is *moderate* if the loss is between 25 and 50 percent. The mortality is *severe* if more than 50 percent of the seedlings die.

A rating of slight also indicates that no special treatment is needed to maintain the seedlings in a managed forest, and no replanting is necessary in plantations. A rating of moderate indicates that some replanting is necessary, both in managed forests and in plantations. A rating of severe indicates that considerable replanting, special seedbed preparation, and superior planting techniques are necessary to insure adequate and immediate restocking.

When an opening is made in the tree canopy, undesirable trees, shrubs, and other plants may invade the site and hinder the restocking and growth of desirable trees. Competition from unwanted plants is *slight* if it does not prevent adequate natural regeneration and early growth or interfere with the normal development of planted seedlings. Competition is *moderate* if it delays the establishment and slows the growth of seedlings, either naturally occurring or planted, but does not prevent the eventual development of a fully stocked, normal stand. Competition is *severe* if it prevents adequate restocking, either natural or artificial, without intensive site preparation and special maintenance practices.

Sites where plant competition is severe require either the selection for planting of species that can survive and grow well with the invaders or special management practices that reduce or remove the invaders. In managed woodlands, clear cutting a small block around the seed tree may be necessary, especially for such intolerant species as black cherry, yellow-poplar, and white pine. In old plantations, it may be necessary to plant seedlings

[2] VERNAL C. MILES, woodland specialist, Soil Conservation Service, assisted with this section.

[3] Italic numbers in parentheses refer to Literature Cited, p. 108.

2 years old or older after intensive site preparation that includes tillage to remove invaders. Mowing also will be necessary, until the trees are established.

Some soil characteristics and topographic features restrict or prohibit the use of equipment for planting and harvesting of trees, for constructing roads, for controlling fires, and for destroying unwanted vegetation. The equipment limitation is *slight* if there are only slight restrictions or no restrictions on the type of equipment that can be used or on the time of year that the equipment can be used. It is *moderate* if the slopes are 20 to 50 percent, or if the soils are wet up to 3 months a year. The limitation is *severe* if the slopes are greater than 50 percent, if the soils are wet for more than 3 months, or if the use of equipment seriously damages tree roots or soil structure.

The hazard of erosion is rated according to the risk of erosion on the woodland. The hazard is rated *slight* if no erosion control measures are necessary, *moderate* if some attention needs to be given to controlling erosion, and *severe* if intensive erosion control measures are necessary. Erosion of woodland can be reduced by constructing logging roads on the contour and using culverts to remove excess water.

Some soil characteristics affect the development of tree roots and, consequently, determine the resistance of a tree to the force of the wind. The windthrow hazard is *slight* if tree roots are deep and well developed. It is *moderate* if roots hold the tree firmly except during periods of extreme wetness or of greatest wind velocity. The hazard is *severe* if roots do not hold the tree firmly during periods of moderate wetness or of moderate to high winds. If the windthrow hazard is severe, light cutting according to single-tree selection is desirable.

## Use of the Soils for Wildlife [4]

Indiana County supports a wide variety of wildlife and fish. Small game is abundant throughout most of the county, and trout and warm-water game fish are plentiful. Moreover, the potential for further development of wildlife resources is excellent because the soils, the relief, and the land use are favorable.

The soils affect the wildlife population through their influence on the vegetation that supplies food and cover for wildlife. Under natural conditions, the patterns or combinations of vegetation in an area depend on the distribution of the various kinds of soils. An area is inhabited by the kinds of wildlife that have their habitat requirements met by the vegetation in the area. If the natural conditions in the area are altered by drainage or by other practices for managing farmland or woodland, the kinds and patterns of vegetation change. With this change in vegetation, there may also be a change in the kinds and numbers of wildlife.

### Wildlife Resources and Habitat Requirements

Cottontail rabbits are the most abundant small-game animals in the county. They are found in greatest numbers in the southern part of the county and around Marion Center, in the Monongahela-Allegheny-Pope-Philo and Gilpin-Wharton-Cavode soil associations. (See soil association map at the back of this report.) These associations are used extensively for agriculture. Cottontail rabbits are also fairly abundant in the Gilpin-Weikert-Ernest association, which is in the western part of the county. Much of this association is planted to Christmas trees, but there is sufficient herbaceous ground cover to provide food and cover. As the trees grow, however, lesser amounts of herbaceous plants will be available, and the number of rabbits can be expected to decrease.

Cottontail rabbits are most plentiful in agricultural areas. They prefer brushy areas interspersed with cropland and grassland, but some are found in large cultivated fields and in large wooded areas. Generally, they do not thrive in stony, mountainous, wooded places.

Gray squirrels are second in abundance. They can be found in farm woodlots throughout the county but are most plentiful in the northern and eastern parts, in the Dekalb-Clymer-Cookport and Dekalb-Clymer-Ernest soil associations. These associations are covered mostly with red, black, and chestnut oaks. Gray squirrels are also numerous where cornfields are interspersed in woodlots of oak and hickory. They generally prefer the edges of woodland and openings in the woodland to large unbroken tracts of trees.

Ring-necked pheasants occur throughout the farmed areas in the county but are most common in the southern part, in the Gilpin-Westmoreland-Guernsey association, the Gilpin-Wharton-Upshur association, the Gilpin-Clymer-Wharton association, and the Gilpin-Wharton-Cavode association. Large areas of fertile farmland, especially areas where corn and small grain are grown, support the greatest numbers. All pheasant ranges in the county are considered second class because natural reproduction of the birds is not adequate. Stocking is necessary to provide good hunting.

Ruffed grouse prefer areas of brushy young trees interspersed with open land. Habitat of this kind occurs mainly in the Gilpin-Weikert-Ernest association, where abandoned cropland is reverting to forest or is being planted to conifers, and the Dekalb-Clymer-Ernest and Dekalb-Clymer Cookport associations, both of which have large wooded areas.

Bobwhite quail are found in all agricultural areas in the county but in limited numbers. They like small fields of corn or small grain that adjoin meadows, brushy areas, or small woodlots. They do not thrive in large areas of farmland that are clean cultivated or in extensive grasslands. The severe winters are partly responsible for the limited numbers of quail in the county.

Mourning doves are most common in the Gilpin-Weikert-Ernest association, the Gilpin-Wharton-Cavode association, the Gilpin-Clymer-Wharton association, and the Gilpin-Wharton-Upshur association. They thrive in areas where corn and small grains are grown, and although some nest in pine-tree plantations, most prefer to nest and roost in trees adjacent to open land.

Woodcocks are found mostly in the Monongahela-Allegheny-Pope-Philo association. They prefer moist areas where earthworms are common and the vegetation is a little brushy. A moist pasture that is growing up to crabapple trees is an ideal habitat for woodcocks.

[4] By CLAYTON L. HEINEY, wildlife biologist, Soil Conservation Service.

TABLE 2.—*Woodland*

| Woodland group and map symbols | Quality of site | Potential productivity for oak [1] | |
|---|---|---|---|
| | | Site index | Estimated total yield per acre |
| | | | *Bd. ft., International rule* |
| Group 1: Deep, well-drained soils on flood plains (Pm, Po) | Excellent | >75 | 13, 750 |
| Group 2: Deep, moderately well drained or somewhat poorly drained soil on flood plains (Ph). | Good | 65 to 74 | 9, 750 |
| Group 3: Deep, poorly drained, permeable soil on flood plains (At) | Fair | 55 to 64 | 6, 300 |
| Group 4: Deep, well-drained soils on terraces and uplands; slopes of 0 to 35 percent (AhA, AhB2, AhC2, ClA2, ClB2, ClC2, CmB, CmD). | Excellent | >75 | 13, 750 |
| Group 5: Deep, moderately well drained or somewhat poorly drained, permeable soils in valleys and on uplands; slopes of 3 to 15 percent (CkB2, CkC2, GyB2, GyC3, VaB2, VaC2). | Good | 65 to 74 | 9, 750 |
| Group 6: Deep, well-drained soils on uplands; slopes of 3 to 25 percent; water-holding capacity is moderate (UgB2, UgC2, UgC3, UgD2, UgD3). | Good | 65 to 74 | 9, 750 |
| Group 7: Moderately deep to shallow, well-drained soil on uplands; slopes of 25 to 45 percent; water-holding capacity is moderately low (UgE3). | Fair | 55 to 64 | 6, 300 |
| Group 8: Deep, moderately well drained soils on uplands, in valleys, and on terraces; slopes of 0 to 25 percent; these soils have a fragipan or a fine-textured subsoil (CoA, CoB2, CoC2, CpB, CpC, ErA2, ErB2, ErB3, ErC2, ErC3, ErD2, EsB, EsC, MoA2, MoB2, MoC2, WrA, WrB2, WrC2, WrC3, WrD2). | Good | 65 to 74 | 9, 750 |
| Group 9: Moderately deep, well-drained soils on uplands; slopes of 0 to 35 percent (DaA2, DaB2, DaC2, DbB, DgB, DgD, GcA2, GcB2, GcC2, GcD2, GnB, GnD, WmB2, WmC2, WmD3). | Good | 65 to 74 | 9, 750 |
| Group 10: Moderately deep,well-drained soil on uplands; slopes of 35 to 100 percent (DgF). | Fair | 55 to 64 | 6, 300 |
| Group 11: Deep, somewhat poorly drained soils on uplands and terraces; slopes of 0 to 25 percent; these soils have a fragipan or a fine-textured subsoil (CaA, CaB2, CaC2, CaD2, CcC3, CdB, CdC, TrA, TrB2). | Good | 65 to 74 | 9, 750 |
| Group 12: Deep, poorly drained soils on uplands and in valleys; slopes of 0 to 8 percent; these soils have a fragipan or a fine-textured subsoil (ArA, ArB2, BkA, BkB2, BsB, NoA, NoB, PuA). | Fair | 55 to 64 | 6, 300 |
| Group 13: Shallow, well-drained soils on uplands; slopes of 35 to 100 percent; water-holding capacity is low (GpE2, GrF). | Poor | <55 | <3, 250 |
| Group 14: Moderately deep, well-drained soils on uplands; slopes of 12 to 35 percent; water-holding capacity is very low (DkD2, DrD). | Poor | <55 | <3, 250 |
| Group 15: Moderately deep, well-drained soils on uplands; slopes of 35 to 100 percent; water-holding capacity is very low (RcE, RdF). | Poor | <55 | <3, 250 |
| Group 16: Very shallow, well-drained soils on uplands; slopes of 0 to 35 percent; water-holding capacity is very low (GwA2, GwB2, GwC2, WgB3, WgC3, WkD2, WkD3). | Poor | <55 | <3, 250 |
| Group 17: Very shallow, well-drained soils on uplands; slopes of 35 to 100 percent; water-holding capacity is very low (WkF2, WkF3). | Poor | <55 | <3, 250 |
| Group 18: Deep, very poorly drained soils in valleys; slopes of 0 to 8 percent (BnA, BnB, BtB). | Poor | <55 | <3, 250 |

[1] Reference age is 50 years.

*groups of soils*

| Species priority | | Hazards and limitations | | | | |
|---|---|---|---|---|---|---|
| Species to favor in managing existing woodland | Species preferred for planting | Seedling mortality | Plant competition | Equipment limitations | Erosion hazard | Windthrow hazard |
| Tulip-poplar, red oak, black cherry, white pine, ash. | White pine, larch, Norway spruce, Austrian pine. | Slight | Severe | Slight | Slight | Slight. |
| Red oak, tulip-poplar, black cherry, ash, white pine. | Larch, white pine, Norway spruce, Austrian pine. | Slight | Severe | Moderate | Slight | Slight or moderate. |
| White pine, hemlock, red maple. | White pine, white spruce. | Moderate | Severe | Severe | Slight | Slight or moderate. |
| Red oak, tulip-poplar, ash, black cherry, white pine. | Larch, white pine, Norway spruce, Austrian pine. | Slight | Severe | Slight or moderate. | Slight or moderate. | Slight. |
| Tulip-poplar, red oak, black cherry, ash, white pine, black locust. | Larch, white pine, Norway spruce, Austrian pine, black walnut. | Slight | Severe | Moderate | Slight or moderate. | Slight or moderate. |
| Red oak, tulip-poplar, black cherry, ash, white pine. | Larch, white pine, Norway spruce, Austrian pine. | Slight | Severe | Slight or moderate. | Slight or moderate. | Slight. |
| Red oak, tulip-poplar, black cherry, ash, white pine. | Larch, white pine, Norway spruce, Austrian pine. | Slight | Severe | Severe | Severe | Slight. |
| Tulip-poplar, red oak, black cherry, ash, white pine. | Larch, Norway spruce, white pine, Austrian pine. | Slight | Severe | Moderate | Slight or moderate. | Slight or moderate. |
| Red oak, tulip-poplar, black cherry, white pine, black locust, black walnut. | Larch, white pine, Austrian pine, Norway spruce, black locust, black walnut. | Slight | Severe | Slight or moderate. | Slight or moderate. | Slight. |
| Red oak, white pine, tulip-poplar. | Larch, white pine, Austrian pine, Norway spruce. | Slight | Severe | Severe | Severe | Slight. |
| Red oak, tulip-poplar, ash, white pine. | Larch, white pine, white spruce. | Slight | Severe | Moderate | Slight or moderate. | Slight or moderate. |
| Red oak, tulip-poplar, white pine. | White pine, white spruce. | Moderate | Severe | Severe | Slight or moderate. | Moderate or severe. |
| Red oak, black oak, white pine. | White pine, Austrian pine, pitch pine. | Severe | Slight | Severe | Severe | Moderate. |
| (2) | White pine, pitch pine | Severe | Slight | Slight or moderate. | Slight or moderate. | Slight. |
| (2) | White pine, pitch pine | Severe | Slight | Severe | Severe | Slight. |
| (2) | Pitch pine | Severe | Slight | Slight or moderate. | Slight or moderate. | Slight. |
| (2) | Pitch pine | Severe | Slight | Severe | Severe | Severe. |
| Red maple, white pine, hemlock. | White pine, white spruce | Severe | Severe | Severe | Slight or moderate. | Severe. |

[2] No commercial woodland on soils in this group.

Wild turkeys confine themselves mainly to the rough, wooded areas in the eastern third of the county. Their number is limited and is not expected to increase, because for a habitat, they require extensive wooded areas where there is not much farming. Natural reproduction of these birds is limited, and hunting depends upon continual stocking.

White-tailed deer are abundant throughout the county, especially in the Dekalb-Clymer-Ernest and Dekalb-Clymer-Cookport soil associations. White-tailed deer are considered forest animals, but they neither prefer nor do well in large mature forests. They prefer a combination of brush or young trees, lesser amounts of mature trees, and small open areas.

Ducks, muskrats, and other wildlife that require an aquatic habitat are most common in the Monongahela-Allegheny-Pope-Philo soil association. They are likely to be found, however, in poorly drained or very poorly drained areas in most of the other soil associations.

Six streams in the county provide more than 52 miles of trout fishing. These are Little Mahoning Creek, Yellow Creek, Little Yellow Creek, Laurel Run, Brush Creek, and the south branch of Two Lick Creek. Three streams—Mahoning Creek, Yellow Creek, and Little Mahoning Creek—provide about 42 miles of fishing for largemouth and smallmouth bass.

Numerous nongame birds and mammals also find habitats in Indiana County.

## Suitability of the Soils for Wildlife

Table 3 gives ratings for the soils in Indiana County according to their suitability for six kinds of wildlife food and cover plants, two kinds of water developments, and three groups of wildlife. Miscellaneous land types, except Stony land, were excluded from this table because their characteristics are so variable. The categories in table 3 are explained in the following paragraphs.

*Grain and seed crops.*—Domestic grains or seed-producing annual herbaceous plants that produce food for wildlife; examples are corn, sorghum, wheat, millet, buckwheat, soybeans, and sunflowers.

*Grasses and legumes.*—Domestic perennial grasses and herbaceous legumes that furnish food and cover for wildlife, examples are fescue, brome, bluegrass, timothy, redtop, orchardgrass, reed canarygrass, clover, trefoil, alfalfa, and sericea lespedeza.

TABLE 3.—*Suitability of the soils for elements of wildlife habitats and for kinds of wildlife*

[The figure *1* denotes *well suited*; the figure *2* denotes *suited*; the figure *3* denotes *poorly suited*; and the figure *4* denotes *not suited*]

| Soil series and map symbols | Elements of wildlife habitats | | | | | | | | Kinds of wildlife | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | Grain and seed crops | Grasses and legumes | Wild herbaceous upland plants | Hardwood woodland plants | Coniferous woodland plants | Wetland food and cover plants | Shallow water developments | Excavated ponds | Openland wildlife | Woodland wildlife | Wetland wildlife |
| Allegheny: | | | | | | | | | | | |
| AhA, AhB2 | 1 | 1 | 1 | 1 | 1 | 4 | 4 | 4 | 1 | 1 | 4 |
| AhC2 | 2 | 2 | 1 | 1 | 1 | 4 | 4 | 4 | 1 | 1 | 4 |
| Armagh: | | | | | | | | | | | |
| ArA | 3 | 3 | 2 | 2 | 2 | 1 | 1 | 1 | 3 | 2 | 1 |
| ArB2 | 3 | 3 | 2 | 2 | 2 | 3 | 4 | 4 | 3 | 2 | 4 |
| Atkins: | | | | | | | | | | | |
| At | 3 | 2 | 2 | 1 | 2 | 2 | 3 | 4 | 2 | 1 | 3 |
| Brinkerton: | | | | | | | | | | | |
| BkA | 3 | 3 | 2 | 2 | 2 | 1 | 1 | 1 | 3 | 2 | 1 |
| BkB2 | 3 | 3 | 2 | 2 | 2 | 3 | 4 | 4 | 3 | 2 | 4 |
| BnA | 4 | 3 | 3 | 1 | 1 | 1 | 1 | 1 | 3 | 1 | 1 |
| BnB | 4 | 4 | 3 | 1 | 1 | 1 | 4 | 4 | 3 | 2 | 4 |
| BsB | 4 | 3 | 2 | 2 | 2 | 3 | 4 | 4 | 3 | 2 | 4 |
| BtB | 4 | 3 | 2 | 2 | 2 | 3 | [1]3 | 4 | 3 | 2 | 4 |
| Cavode: | | | | | | | | | | | |
| CaA | 2 | 2 | 2 | 2 | 3 | 2 | 2 | 2 | 2 | 2 | 2 |
| CaB2 | 2 | 2 | 2 | 2 | 3 | 3 | 4 | 4 | 2 | 2 | 4 |
| CaC2 | 2 | 2 | 2 | 2 | 3 | 4 | 4 | 4 | 2 | 2 | 4 |
| CaD2, CcC3 | 3 | 2 | 2 | 2 | 3 | 4 | 4 | 4 | 2 | 2 | 4 |
| CdB | 4 | 3 | 2 | 2 | 3 | 3 | [1]3 | 4 | 3 | 3 | [2]3 |
| CdC | 4 | 3 | 2 | 2 | 3 | 4 | 4 | 4 | 3 | 3 | 4 |
| Clarksburg: | | | | | | | | | | | |
| CkB2, CkC2 | 2 | 1 | 1 | 1 | 3 | 4 | 4 | 4 | 1 | 1 | 4 |

See footnotes at end of table.

TABLE 3.—*Suitability of the soils for elements of wildlife habitats and for kinds of wildlife*—Con.

| Soil series and map symbols | Elements of wildlife habitats | | | | | | | | Kinds of wildlife | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | Grain and seed crops | Grasses and legumes | Wild herbaceous upland plants | Hardwood woodland plants | Coniferous woodland plants | Wetland food and cover plants | Shallow water developments | Excavated ponds | Openland wildlife | Woodland wildlife | Wetland wildlife |
| Clymer: | | | | | | | | | | | |
| ClA2 | 1 | 1 | 1 | 1 | 3 | 4 | 4 | 4 | 1 | 1 | 4 |
| ClB2 | 2 | 1 | 1 | 1 | 3 | 4 | 4 | 4 | 1 | 1 | 4 |
| ClC2 | 3 | 2 | 1 | 1 | 3 | 4 | 4 | 4 | 2 | 2 | 4 |
| CmB, CmD | 4 | 3 | 1 | 1 | 3 | 4 | 4 | 4 | 3 | 2 | 4 |
| Cookport: | | | | | | | | | | | |
| CoA | 2 | 1 | 1 | 1 | 3 | 3 | 3 | 3 | 1 | 1 | 3 |
| CoB2 | 2 | 1 | 1 | 2 | 2 | 4 | 4 | 3 | 1 | 2 | 4 |
| CoC2 | 2 | 1 | 1 | 1 | 2 | 3 | 4 | 4 | 1 | 1 | 4 |
| CpB | 4 | 3 | 1 | 1 | 3 | 3 | [1] 3 | 3 | 3 | 2 | [2] 3 |
| CpC | 4 | 3 | 1 | 1 | 3 | 4 | 4 | 4 | 3 | 2 | 4 |
| Dekalb:[3] | | | | | | | | | | | |
| DaA2, DaB2 | 2 | 2 | 2 | 2 | 2 | 4 | 4 | 4 | 2 | 2 | 4 |
| DaC2 | 3 | 2 | 2 | 2 | 2 | 4 | 4 | 4 | 2 | 2 | 4 |
| DbB | 4 | 3 | 2 | 2 | 2 | 4 | 4 | 4 | 3 | 2 | 4 |
| Ernest: | | | | | | | | | | | |
| ErA2 | 2 | 1 | 1 | 1 | 3 | 3 | 3 | 3 | 1 | 1 | 3 |
| ErB2 | 2 | 1 | 1 | 2 | 2 | 3 | 4 | 4 | 1 | 2 | 4 |
| ErB3 | 2 | 2 | 1 | 1 | 3 | 4 | 4 | 4 | 1 | 2 | 4 |
| ErC2, ErD2 | 2 | 1 | 1 | 1 | 3 | 4 | 4 | 4 | 1 | 1 | 4 |
| ErC3 | 3 | 2 | 1 | 1 | 3 | 4 | 4 | 4 | 2 | 2 | 4 |
| EsB | 4 | 3 | 1 | 1 | 3 | 3 | [1] 3 | 3 | 3 | 2 | [2] 3 |
| EsC | 4 | 3 | 1 | 1 | 3 | 4 | 4 | 4 | 3 | 2 | 4 |
| Gilpin: | | | | | | | | | | | |
| GcA2 | 2 | 2 | 1 | 1 | 2 | 4 | 4 | 4 | 2 | 2 | 4 |
| GcB2 | 2 | 1 | 1 | 1 | 3 | 4 | 4 | 4 | 1 | 1 | 4 |
| GcC2 | 3 | 2 | 1 | 1 | 3 | 4 | 4 | 4 | 2 | 2 | 4 |
| GcD2 | 4 | 3 | 1 | 1 | 3 | 4 | 4 | 4 | 3 | 2 | 4 |
| GnB, GnD | 4 | 3 | 1 | 1 | 3 | 4 | 4 | 4 | 3 | 2 | 4 |
| GpE2 [4] | 4 | 4 | 2 | 2 | 2 | 4 | 4 | 4 | 3 | 2 | 4 |
| GrF [4] | 4 | 4 | 3 | 3 | 3 | 4 | 4 | 4 | 4 | 4 | 4 |
| GwA2 [4] | 3 | 3 | 2 | 2 | 2 | 4 | 4 | 4 | 3 | 2 | 4 |
| GwB2 [4] | 3 | 3 | 2 | 2 | 2 | 4 | 4 | 4 | 3 | 2 | 4 |
| GwC2 [4] | 4 | 3 | 2 | 2 | 2 | 4 | 4 | 4 | 3 | 2 | 4 |
| Guernsey: | | | | | | | | | | | |
| GyB2, GyC3 | 2 | 1 | 1 | 1 | 3 | 4 | 4 | 4 | 1 | 1 | 4 |
| Monongahela: | | | | | | | | | | | |
| MoA2 | 2 | 1 | 1 | 1 | 3 | 3 | 3 | 3 | 1 | 1 | 3 |
| MoB2, MoC2 | 2 | 1 | 1 | 1 | 3 | 4 | 4 | 4 | 1 | 1 | 4 |
| Nolo: | | | | | | | | | | | |
| NoA | 3 | 3 | 2 | 2 | 2 | 1 | 1 | 1 | 3 | 2 | 1 |
| NoB | 3 | 3 | 2 | 2 | 2 | 3 | 4 | 4 | 3 | 2 | 4 |
| Philo: | | | | | | | | | | | |
| Ph | 2 | 1 | 1 | 1 | 3 | 3 | 3 | 3 | 1 | 1 | 3 |
| Pope: | | | | | | | | | | | |
| Pm, Po | 2 | 1 | 1 | 1 | 3 | 4 | 4 | 4 | 1 | 1 | 4 |
| Purdy: | | | | | | | | | | | |
| PuA | 4 | 3 | 3 | 1 | 1 | 1 | 1 | 1 | 3 | 1 | 1 |
| Ramsey:[5] | | | | | | | | | | | |
| RcE, RdF | 4 | 3 | 2 | 2 | 2 | 4 | 4 | 4 | 3 | 2 | 4 |
| Stony land: | | | | | | | | | | | |
| So, Sp | 4 | 4 | 3 | 3 | 3 | 4 | 4 | 4 | 4 | 3 | 4 |

See footnotes at end of table.

TABLE 3.—*Suitability of the soils for elements of wildlife habitats and for kinds of wildlife*—Con.

| Soil series and map symbols | Elements of wildlife habitats | | | | | | | | Kinds of wildlife | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | Grain and seed crops | Grasses and legumes | Wild herbaceous upland plants | Hardwood woodland plants | Coniferous woodland plants | Wetland food and cover plants | Shallow water developments | Excavated ponds | Openland wildlife | Woodland wildlife | Wetland wildlife |
| Tygart: | | | | | | | | | | | |
| TrA | 4 | 2 | 2 | 1 | 1 | 1 | 1 | 1 | 3 | 1 | 2 |
| TrB2 | 4 | 2 | 2 | 2 | 2 | 3 | 4 | 2 | 3 | 2 | 4 |
| Upshur: [6] | | | | | | | | | | | |
| UgB2, UgC2, UgC3 | 2 | 2 | 1 | 1 | 1 | 4 | 4 | 4 | 1 | 1 | 4 |
| UgD2 | 3 | 2 | 1 | 1 | 1 | 4 | 4 | 4 | 1 | 1 | 4 |
| UgD3, UgE3 | 3 | 2 | 2 | 1 | 1 | 4 | 4 | 4 | 3 | 1 | 4 |
| Vandergrift: | | | | | | | | | | | |
| VaB2, VaC2 | 2 | 1 | 1 | 1 | 3 | 4 | 4 | 4 | 1 | 2 | 1 |
| Weikert: [7] | | | | | | | | | | | |
| WgB3 | 3 | 3 | 2 | 2 | 2 | 4 | 4 | 4 | 3 | 2 | 4 |
| WgC3, WkD2, WkD3, WkF2, WkF3 | 4 | 3 | 2 | 2 | 2 | 4 | 4 | 4 | 3 | 2 | 4 |
| Westmoreland: | | | | | | | | | | | |
| WmB2 | 2 | 1 | 1 | 1 | 3 | 4 | 4 | 4 | 1 | 1 | 4 |
| WmC2 | 3 | 2 | 1 | 1 | 3 | 4 | 4 | 4 | 2 | 2 | 4 |
| WmD3 | 4 | 4 | 1 | 1 | 3 | 4 | 4 | 4 | 3 | 2 | 4 |
| Wharton: | | | | | | | | | | | |
| WrA | 2 | 1 | 1 | 1 | 3 | 3 | 3 | 3 | 1 | 1 | 3 |
| WrB2, WrC2 | 2 | 1 | 1 | 1 | 3 | 4 | 4 | 4 | 1 | 1 | 4 |
| WrC3, WrD2 | 3 | 2 | 1 | 1 | 3 | 4 | 4 | 4 | 2 | 2 | 4 |

[1] Rating is 4 on all slopes greater than 3 percent.
[2] Rating is 4 if rating for shallow water developments is 4.
[3] To estimate suitability of the Dekalb-Gilpin complexes (DgB, DgD, DgF) and of the Dekalb and Ramsey undifferentiated groups (DkD2, DrD), see the ratings for the individual soils that make up these mapping units.
[4] Ratings are for the Weikert soil. See ratings for the Gilpin soils.
[5] Ratings are for the Ramsey soil. See ratings for the Dekalb soils.
[6] Ratings are for the Upshur soil. See ratings for the Gilpin soils.
[7] Ratings are for the Weikert soil. See ratings for the Gilpin soils.

*Wild herbaceous upland plants.*—Native or introduced perennial grasses or forbs that generally are established naturally and that provide food and cover principally for upland wildlife; examples are ragweed, wheatgrass, wild rye, oatgrass, pokeweed, strawberry, beggarweed, goldenrod, and dandelion.

*Hardwood woodland plants.* — Deciduous trees, shrubs, and woody vines that produce fruits, nuts, buds, catkins, twigs, or foliage used as food by wildlife, and that commonly are established naturally but may be planted; examples are oak, beech, cherry, hawthorn, dogwood, viburnum, holly, maple, birch, poplar, grape, honeysuckle, blueberry, raspberry, greenbrier, briers, and roses.

*Coniferous woodland plants.* — Cone-bearing trees and shrubs that are important to wildlife primarily as cover but also furnish food in the form of browse, seeds, or cones; these trees and shrubs are commonly established naturally but may be planted; examples are pine, spruce, white-cedar, hemlock, fir, redcedar, juniper, and yew.

*Wetland food and cover plants.*—Annual and perennial wild herbaceous plants in moist to wet places; examples are smartweed, wild millet, wild rice, switchgrass, reed canarygrass, bulrushes, sedges, and cattails. Wetland food plants do not include submerged or floating aquatic plants that provide food and cover for aquatic wildlife.

*Shallow water developments.*—Water generally not more than 5 feet deep, in excavations or in impoundments created by building low dikes or levees or by using such devices as those that control the water level of marshy streams or channels.

*Excavated ponds.*—Dug-out areas or a combination of dug-out areas and dammed areas that hold water of suitable quality and in suitable amounts for fish or wildlife. Excavated ponds should have a surface area of at least a quarter of an acre and a depth of 6 feet or more in at least a quarter of the area. They require a water table that is high most of the time or another source of unpolluted water of low acidity.

*Open-land wildlife.*—Birds and mammals commonly found in crop fields, in meadows and pastures, and on nonforested overgrown land; examples are quail, ring-necked pheasants, mourning doves, woodcocks, cottontail rabbits, meadowlarks, killdeer, and field sparrows.

*Woodland wildlife.*—Birds and mammals commonly found in wooded areas; examples are ruffed grouse, wild turkeys, wood thrushes, warblers, vireos, deer, squirrels, and raccoons.

*Wetland wildlife.*—Birds and mammals commonly found in marshes and swamps; examples are ducks, geese, herons, snipes, rails, coots, muskrats, minks and beavers.

# Engineering Applications [5]

Soils engineering deals with soil as structural material and as foundation material upon which structures are built. Some soil properties are of special interest to engineers because they affect the construction and maintenance of roads, airports, pipelines, building foundations, water storage facilities, erosion control structures, drainage systems, and sewage disposal systems. The soil properties most important to the engineer are shear strength, drainage, grain size, plasticity, and permeability to water. Compaction characteristics, shrink-swell characteristics, depth to water table, depth to bedrock, topography, and degree of acidity or alkalinity are perhaps as important. These properties and characteristics are discussed in this section.

With the use of the soil map for identification, the engineering interpretations reported here can be used to—

1. Make soil and land use studies that will aid in the selection and development of industrial, business, residential, and recreational sites.
2. Make preliminary estimates of soil properties in planning for conservation of soil and water, including the planning of systems for surface drainage and internal drainage and systems for water storage and water supply.
3. Make preliminary evaluations of soil conditions that will aid in selecting locations for highways, airports, pipelines, and cables and in planning detailed investigations of the selected locations.
4. Correlate performance of engineering structures with types of soil and thus develop information that will be useful in overall planning, designing, and maintaining of other engineering structures.
5. Determine the suitability of soils for cross-country movement of vehicles and construction equipment.
6. Supplement information from other published maps, reports, and aerial photographs in preparing maps or reports for specific areas.
7. Estimate the nature of material encountered when excavating in construction areas.
8. Determine the suitability of soils for artificial drainage and for septic tank systems.

It should be emphasized that the engineering interpretations reported here may not eliminate the need for sampling and testing at the site of specific engineering works involving heavy loads and excavations deeper than the depths of layers here reported. Even in these situations, the soil map is useful for planning more detailed field investigations and for suggesting the kinds of problems that may be expected.

Some terms used by soil scientists may not be familiar to engineers, and other terms have special meanings in soil science. Many of the terms soil scientists use in describing soils are defined in the Glossary at the back of this report.

Other parts of this report, particularly the section "Descriptions of the Soils," can be informative and useful to the engineer.

## Engineering Classification Systems

Most highway engineers classify soils according to the system approved by the American Association of State Highway Officials (AASHO) (*1*). In this system soil materials are classified in seven principal groups. The groups range from A-1, which consists of gravelly soils of high bearing capacity, to A-7, which consists of clayey soils that have low strength when wet. Within each group the relative engineering value of the soil material is indicated by a group index. Group indexes range from 0 for the best material to 20 for the poorest. The group index is shown in parentheses following the soil group symbol, for example, A-6(8).

Some engineers prefer to use the Unified soil classification system (*18*). In this system, soils are identified as coarse grained (eight classes), fine grained (six classes), and highly organic (one class). An approximate classification of soils by this system can be made in the field.

Table 4 shows the AASHO and the Unified classification of specified soils in the county as determined by laboratory tests. Table 5 shows the estimated classification of all soils in the county according to both systems.

## Engineering Test Data

To help evaluate the soils for engineering purposes, samples from several profiles of some of the major soils in Indiana County were tested according to standard procedures. Table 4 gives the results of the tests.

The two engineering classifications given each soil sample in table 4 are based on the liquid limit, the plasticity index, and the data obtained by mechanical analysis. The mechanical analysis was made by combined sieve and hydrometer methods. Clay content was obtained by the hydrometer method; the reported percentages of clay therefore are not suitable for naming textural classes for soils.

[5] This section was prepared with the assistance of JAMES DUNLAP, engineer, Soil Conservation Service, and in cooperation with the Pennsylvania Department of Highways.

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The liquid limit and the plasticity index indicate the effect of water on the consistence of the soil material. As the moisture content of a clayey soil increases from a dry state, the material changes from semisolid to plastic. As the moisture content is further increased, the material changes from plastic to liquid. The *plastic limit* is the moisture content at which the soil material changes from semisolid to plastic. The *liquid limit* is the moisture content at which the material changes from plastic to liquid. The *plasticity index* is the numerical difference between the liquid limit and the plastic limit. It indicates the range of moisture content within which the soil material is plastic.

Table 4 also gives moisture-density (compaction) data for the tested soils. In the moisture-density test, soil material is compacted into a mold several times, each time at a successively higher moisture content but with the compactive effort remaining constant. The dry density (unit weight) of the compacted material increases as the moisture content increases, until the optimum moisture content is reached. After that, the dry density decreases as the moisture content increases. The data are plotted with dry density versus moisture, and the highest dry density obtained is the *maximum dry density*, and the corresponding moisture content is the *optimum moisture*. Moisture-density data are important in earthwork because, as a rule,

TABLE 4.—*Engineering*

[Tests performed by the Pennsylvania Department of Highways according to standard

| Soil name and location | Parent material | Pennsylvania report number | Depth | Horizon | Moisture-density data [1] | |
|---|---|---|---|---|---|---|
| | | | | | Maximum dry density | Optimum moisture |
| | | | *Inches* | | *Lb. per cu. ft.* | *Percent* |
| Atkins silt loam: | | | | | | |
| 4 miles NE. of Clarksburg and 100 feet E. of T. 440 and L.R. 32032. (Modal). | Alluvium (flood plain). | BJ–4284<br>BJ–4285 | 15 to 25<br>25 to 37 | B2g<br>C1g | 101<br>106 | 20<br>18 |
| 4 miles W. of Indiana; W. of T. 562 and 300 feet S. of U.S. 422. (Heavier textured). | Alluvium (flood plain). | BJ–211<br>BJ–212 | 9 to 21<br>21 to 40 | C1g<br>C2g | 109<br>107 | 18<br>18 |
| 1 mile N. of Wandin on E. side of L.R. 32064. (More clayey). | Alluvium (flood plain). | BH–27787<br>BH–27788 | 12 to 18<br>18 to 30 | C1g<br>C2g | 105<br>104 | 18<br>18 |
| Brinkerton silt loam: | | | | | | |
| 3.5 miles NE. of Indiana and 700 feet E. of U.S. 119. (Modal). | Colluvium (sandstone, siltstone, and shale). | BH–34703<br>BH–34704 | 17 to 26<br>39 to 54 | Bxg<br>C1g | 100<br>109 | 18<br>16 |
| 400 feet SE. of Rt. 286 on N. side of L.R. 32148. (Lighter textured). | Colluvium (sandstone, siltstone, and shale). | BJ–213<br>BJ–214 | 11 to 22<br>39 to 54 | B21g<br>B3g | 108<br>104 | 17<br>18 |
| 0.1 mile W. of Bowdertown and 30 feet SW. of T. 944 on the S. side of L.R. 32087. (Shallow solum). | Colluvium (sandstone, siltstone, and shale). | BJ–219<br>BJ–220 | 9 to 22<br>30 to 42 | B2g<br>C1g | 108<br>119 | 17<br>12 |
| Cavode silt loam: | | | | | | |
| 2.5 miles SE. of Rossiter, 0.25 mile NW. of L.R. 32105, and 125 feet N. of T. 533. (Modal). | Clay shale. | BJ–203<br>BJ–204 | 21 to 30<br>47 to 57 | B22t<br>Cg | 98<br>117 | 18<br>14 |
| 1 mile NE. of Marchand and 200 feet N. of L.R. 32137. (Less clay in B horizon). | Clay shale. | BH–34707<br>BH–34708 | 15 to 26<br>32 to 42 | B22g<br>C1g | 104<br>107 | 18<br>18 |
| 2 miles SW. of Indiana and 800 feet E. of Rt. 286 on N. corner of Wilson Avenue. (Less fines in B horizon). | Interbedded sandstone, siltstone, and shale. | BJ–215<br>BJ–216 | 17 to 30<br>47 to 70 | B22g<br>Cg | 112<br>113 | 15<br>16 |
| 1.5 miles SE. of Arcadia and 200 feet N. of Rt. 360 on W. side of T. 940. (Shallow solum; channery). | Black clay shale. | BJ–221<br>BJ–222 | 9 to 16<br>25 to 60 | B2<br>C | 98<br>103 | 22<br>17 |
| Clymer channery loam: | | | | | | |
| 1 mile NW. of Marchand and 600 feet NW. of intersection of L.R. 32110 and Hudson farm lane. (Modal). | Mahoning sandstone (Conemaugh formation). | BH–34713<br>BH–34714 | 15 to 24<br>36 to 42 | B22<br>C1 | 121<br>(4) | 12<br>(4) |
| 1 mile E. of Bowdertown and 0.25 mile NE. of L.R. 32087 on W. side of Rt. 360. (More silt and clay). | Mahoning sandstone (Conemaugh formation). | BH–27779<br>BH–27780 | 12 to 23<br>38 to 48 | B2<br>C1 | 108<br>116 | 16<br>13 |

See footnotes at end of table.

optimum stability is obtained if the soil is compacted to about the maximum dry density at approximately optimum moisture content.

## Estimated Engineering Properties of Soils

Table 5 gives estimates of soil properties that are significant in engineering, and it gives the estimated engineering classification of the soil material in specified layers. This table includes all of the soil series in Indiana County but excludes the miscellaneous land types. Onsite studies are necessary to determine the engineering potential of land types because their properties are so variable.

The data in table 5 are based on laboratory tests, on experience with the same kind of soil in other counties, and on information presented in other parts of this report. The estimates are given for specific layers of the profile described as typical of the series in the section "Descriptions of the Soils." Considerable variation from these estimates should be anticipated. Estimates of some properties are not given for the uppermost layer, because the material in this layer generally is not suitable for use in many engineering structures and commonly is used for topdressing shoulders and slopes of roads to promote the growth of vegetation. Some of the items in this table need no explanation; others are explained in the following paragraphs.

*test data*

procedures of the American Association of State Highway Officials (AASHO) (*1*)]

| Mechanical analysis [2] | | | | | | | | | | Liquid limit | Plasticity index | Classification | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Percentage passing sieve— | | | | | | Percentage smaller than— | | | | | | | |
| 3-in. | ¾-in. | No. 4 (4.7 mm.) | No. 10 (2.0 mm.) | No. 40 (0.42 mm.) | No. 200 (0.074 mm.) | 0.05 mm. | 0.02 mm. | 0.005 mm. | 0.002 mm. | | | AASHO | Unified [3] |
| ------- | 100 | 99 | 99 | 97 | 80 | 74 | 56 | 35 | 24 | 35 | 11 | A-6(8) | ML-CL. |
| 100 | 99 | 93 | 90 | 87 | 69 | 64 | 49 | 30 | 22 | 30 | 7 | A-4(7) | ML-CL. |
| ------- | 100 | 93 | 86 | 79 | 62 | 59 | 44 | 22 | 11 | 36 | 9 | A-4(5) | ML. |
| ------- | 100 | 97 | 91 | 85 | 61 | 57 | 40 | 19 | 10 | 34 | 5 | A-4(5) | ML. |
| ------- | ------ | -------- | 100 | 99 | 76 | 71 | 55 | 36 | 27 | 33 | 9 | A-4(8) | ML-CL. |
| ------- | ------ | -------- | 100 | 99 | 79 | 74 | 58 | 38 | 30 | 34 | 9 | A-4(8) | ML-CL. |
| ------- | ------ | -------- | 100 | 99 | 96 | 94 | 81 | 59 | 47 | 51 | 23 | A-7-6(15) | MH-CH. |
| ------- | ------ | 100 | 99 | 96 | 84 | 82 | 70 | 46 | 33 | 37 | 18 | A-6(11) | CL. |
| ------- | 100 | 94 | 90 | 86 | 65 | 60 | 47 | 32 | 22 | 32 | 4 | A-4(6) | ML. |
| 100 | 98 | 90 | 86 | 83 | 60 | 56 | 44 | 27 | 20 | 33 | 6 | A-4(5) | ML. |
| ------- | 100 | 99 | 98 | 93 | 68 | 64 | 47 | 26 | 16 | 28 | 3 | A-4(7) | ML. |
| 100 | 75 | 64 | 56 | 46 | 27 | 25 | 18 | 9 | 9 | 25 | 4 | A-2-4(0) | SM-SC. |
| ------- | ------ | -------- | -------- | 100 | 93 | 90 | 75 | 55 | 45 | 48 | 19 | A-7-6(13) | ML-CL. |
| 100 | 99 | 84 | 78 | 75 | 68 | 64 | 50 | 31 | 21 | 29 | 7 | A-4(7) | ML-CL. |
| ------- | ------ | -------- | 100 | 95 | 79 | 76 | 64 | 45 | 36 | 43 | 16 | A-7-6(11) | ML-CL. |
| ------- | ------ | -------- | 100 | 98 | 86 | 83 | 68 | 44 | 32 | 39 | 14 | A-6(10) | ML-CL. |
| 100 | 91 | 87 | 82 | 75 | 67 | 65 | 54 | 33 | 25 | 32 | 7 | A-4(6) | ML-CL. |
| 100 | 73 | 63 | 58 | 54 | 41 | 41 | 31 | 22 | 16 | 32 | 10 | A-4(1) | GM-GC. |
| 100 | 95 | 94 | 93 | 91 | 81 | 80 | 73 | 59 | 44 | 47 | 16 | A-7-5(12) | ML. |
| ------- | 100 | 83 | 63 | 44 | 21 | 19 | 15 | 12 | 9 | 32 | 2 | A-1-b(0) | SM. |
| 100 | 64 | 61 | 59 | 47 | 32 | 30 | 24 | 15 | 11 | 23 | 4 | A-2-4(0) | GM-GC. |
| [5] 100 | 52 | 46 | 43 | 26 | 16 | 15 | 12 | 8 | 6 | 22 | 4 | A-1-b(0) | GM-GC. |
| 100 | 71 | 69 | 67 | 65 | 47 | 45 | 38 | 25 | 18 | 29 | 7 | A-4(2) | GM-GC. |
| 100 | 45 | 39 | 38 | 36 | 21 | 20 | 16 | 10 | 8 | 21 | 3 | A-1-b(0) | GM-GG. |

TABLE 4.—*Engineering*

| Soil name and location | Parent material | Pennsylvania report number | Depth | Horizon | Moisture-density data [1] | |
|---|---|---|---|---|---|---|
| | | | | | Maximum dry density | Optimum moisture |
| 0.5 mile NW. of Locust Lane, 180 feet N. of L.R. 32107, and 30 feet W. of wooded area. (More clay in B horizon). | Mahoning sandstone (Conemaugh formation). | BJ-201<br>BJ-202 | 15 to 26<br>31 to 38 | B2<br>C | 116<br>([4]) | 13<br>([4]) |
| 0.25 mile SW. of Bowdertown and 0.5 mile N. of L.R. 32079 on E. side of L.R. 32087. (More sand) | Mahoning sandstone (Conemaugh formation). | BJ-217<br>BJ-218 | 13 to 25<br>37 to 45 | B2<br>C | ([4])<br>120 | ([4])<br>12 |
| Ernest silt loam: | | | | | | |
| 1 mile NE. of Home (Kellysburg) and 400 feet NE. of farm-lane bridge over Pine Run. (Modal) | Colluvium (sandstone, siltstone, and shale). | BH-34705<br>BH-34706 | 17 to 26<br>35 to 52 | Bx<br>Cg | 102<br>115 | 17<br>15 |
| 0.1 mile N. of Shelocta and 300 feet N. of U.S. 422 along farm lane. (Deeper solum) | Colluvium (sandstone, siltstone, and shale). | BJ-207<br>BJ-208 | 15 to 26<br>67 to 97 | B21<br>C | 110<br>122 | 15<br>12 |
| 1.5 miles SE. of Glen Campbell on W. side of T. 940. (More clay in B horizon; channery) | Colluvium (sandstone, siltstone, and shale). | BJ-223<br>BJ-224 | 13 to 23<br>36 to 46 | B22g<br>C | 103<br>120 | 19<br>12 |
| Gilpin channery silt loam: | | | | | | |
| 1 mile N. of Covode and 280 feet SW. of T. 904. (Modal) | Interbedded sandstone, siltstone, and shale. | BH-34711<br>BH-34712 | 14 to 23<br>23 to 30 | B2<br>Cr | 111<br>([4]) | 16<br>([4]) |
| 0.5 mile SE. of Marchand and 500 feet E. of T. 660. (Modal) | Siltstone overlying interbedded shale and sandstone. | BH-34715<br>BH-34716 | 13 to 24<br>24 to 30 | B2<br>C | 111<br>112 | 17<br>15 |
| 0.1 mile N. of Shelocta. (Lighter textured B horizon) | Shale. | BJ-209<br>BJ-210 | 7 to 23<br>35 to 72 | B2<br>C | 118<br>122 | 13<br>13 |
| 4 miles NE. of Clarksburg and 0.25 mile N. of L.R. 32032 on E. side of T. 440. (Less channery) | Shale. | BJ-4282<br>BJ-4283 | 9 to 18<br>24 to 28 | B2<br>C1 | 111<br>114 | 15<br>15 |
| Nolo silt loam: | | | | | | |
| 3 miles S. of Glen Campbell, 0.75 mile NE. of Rt. 360, and 50 feet SE. of T. 940. (Modal) | Sandstone. | BJ-4292<br>BJ-4293 | 17 to 25<br>25 to 40 | Bx1<br>Bx2 | 105<br>112 | 18<br>18 |
| 1.4 miles S. of Kenwood and 300 feet W. of Penns Manor School. (Deeper fragipan) | Shale over sandstone. | BH-27783<br>BH-27784 | 14 to 26<br>30 to 50 | B2g<br>Cmg | 104<br>111 | 21<br>15 |
| 0.2 mile E. of Bowdertown and 20 feet S. of L.R. 32087. (Less clay in B2 horizon) | Sandstone. | BH-27777<br>BH-27778 | 10 to 20<br>20 to 31 | B2g<br>B3mg | 115<br>109 | 15<br>17 |
| Philo silt loam: | | | | | | |
| 1.6 miles SE. of Indiana on W. streambank of Ramsey Run. (Modal) | Recent alluvium. | BJ-4290<br>BJ-4291 | 8 to 17<br>27 to 37 | C1<br>C3g | 106<br>101 | 18<br>19 |
| 3 miles NW. of Homer City along Cherry Run near S. side of T. 469. (More clayey subsoil) | Recent alluvium. | BH-27771<br>BH-27772 | 9 to 20<br>20 to 40 | C1<br>C2g | 100<br>103 | 20<br>18 |
| 1 mile NE. of Hooverhurst. (More sand in lower part of subsoil) | Recent alluvium. | BH-27781<br>BH-27782 | 9 to 21<br>21 to 30 | C1<br>C2g | 105<br>111 | 17<br>16 |
| Pope silt loam: | | | | | | |
| 2 miles S. of Indiana, 100 feet E. of old bridge on U.S. 119, and 400 feet NE. of B. & O. Railroad overpass. (Modal) | Recent alluvium. | BJ-4288<br>BJ-4289 | 12 to 28<br>28 to 40 | C1<br>C2 | 109<br>112 | 16<br>16 |

See footnotes at end of table.

*test data*—Continued

| Mechanical analysis [2] | | | | | | | | | | Liquid limit | Plasticity index | Classification | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Percentage passing sieve— | | | | | | Percentage smaller than— | | | | | | AASHO | Unified [3] |
| 3-in. | ¾-in. | No. 4 (4.7 mm.) | No. 10 (2.0 mm.) | No. 40 (0.42 mm.) | No. 200 (0.074 mm.) | 0.05 mm. | 0.02 mm. | 0.005 mm. | 0.002 mm. | | | | |
| 100 | 73 | 62 | 58 | 55 | 39 | 37 | 30 | 21 | 17 | 32 | 9 | A-4(1) | GM-GC. |
| 100 | 55 | 30 | 25 | 20 | 8 | 7 | 6 | 5 | 4 | 22 | 1 | A-1-a(0) | GP-GM. |
| [6] 100 | 45 | 25 | 23 | 22 | 7 | 6 | 5 | 4 | 3 | 14 | [7] NP | A-1-a(0) | GP-GM. |
| 100 | 78 | 68 | 67 | 65 | 20 | 18 | 16 | 11 | 8 | 14 | NP | A-2-4(0) | SM. |
| ------ | ------ | ------ | ------ | 100 | 98 | 97 | 82 | 54 | 40 | 46 | 20 | A-7-6(13) | ML-CL |
| ------ | 100 | 93 | 86 | 75 | 67 | 65 | 51 | 32 | 24 | 34 | 12 | A-6(7) | ML-CL. |
| ------ | 100 | 98 | 94 | 84 | 75 | 73 | 60 | 36 | 25 | 32 | 7 | A-4(8) | ML-CL. |
| 100 | 81 | 59 | 48 | 35 | 23 | 22 | 18 | 10 | 7 | 27 | 7 | A-2-4(0) | GM-GC. |
| 100 | 99 | 92 | 90 | 86 | 73 | 69 | 58 | 58 | 30 | 38 | 11 | A-6(8) | ML. |
| 100 | 89 | 68 | 59 | 48 | 38 | 36 | 29 | 18 | 14 | 29 | 7 | A-4(1) | GM-GC. |
| 100 | 90 | 78 | 69 | 62 | 54 | 51 | 38 | 25 | 18 | 32 | 7 | A-4(4) | ML-CL. |
| 100 | 43 | 28 | 26 | 23 | 16 | 15 | 12 | 10 | 9 | 28 | 6 | A-1-b(0) | GM-GC. |
| 100 | 95 | 91 | 84 | 79 | 72 | 68 | 54 | 35 | 28 | 35 | 11 | A-6(8) | ML-CL. |
| 100 | 86 | 77 | 70 | 65 | 59 | 56 | 45 | 30 | 23 | 36 | 12 | A-6(6) | ML-CL. |
| 100 | 93 | 71 | 56 | 38 | 35 | 34 | 25 | 11 | 7 | 27 | 2 | A-2-4(0) | SM. |
| 100 | 65 | 40 | 30 | 21 | 18 | 17 | 14 | 6 | 4 | 29 | 6 | A-1-b(0) | GM-GC. |
| 100 | 99 | 89 | 84 | 74 | 69 | 67 | 56 | 33 | 24 | 26 | 6 | A-4(7) | ML-CL. |
| 100 | 88 | 45 | 38 | 30 | 27 | 26 | 21 | 14 | 10 | 30 | 7 | A-2-4(0) | GM-GC. |
| ------ | 100 | 97 | 94 | 90 | 77 | 75 | 60 | 37 | 26 | 31 | 11 | A-6(8) | CL. |
| 100 | 98 | 80 | 68 | 56 | 42 | 40 | 34 | 22 | 16 | 32 | 11 | A-6(2) | SC. |
| 100 | 92 | 91 | 89 | 87 | 76 | 73 | 59 | 40 | 32 | 37 | 11 | A-6(8) | ML-CL. |
| 100 | 92 | 89 | 86 | 83 | 64 | 61 | 47 | 25 | 17 | 28 | 4 | A-4(6) | ML-CL. |
| ------ | 100 | 97 | 95 | 91 | 55 | 52 | 44 | 25 | 19 | 25 | 6 | A-4(4) | ML-CL. |
| ------ | ------ | ------ | 100 | 98 | 70 | 61 | 50 | 32 | 25 | 29 | 7 | A-4(6) | ML-CL. |
| ------ | ------ | 100 | 99 | 97 | 60 | 54 | 40 | 23 | 14 | 28 | 4 | A-4(5) | ML-CL. |
| ------ | 100 | 99 | 99 | 99 | 63 | 57 | 42 | 27 | 18 | 29 | 6 | A-4(6) | ML-CL. |
| ------ | ------ | ------ | ------ | 100 | 86 | 81 | 64 | 46 | 38 | 40 | 11 | A-6(8) | ML. |
| ------ | ------ | ------ | 100 | 98 | 71 | 65 | 52 | 36 | 29 | 33 | 10 | A-4(7) | ML-CL. |
| ------ | ------ | ------ | 100 | 99 | 65 | 59 | 47 | 31 | 24 | 29 | 6 | A-4(6) | ML-CL. |
| ------ | ------ | ------ | 100 | 97 | 52 | 46 | 35 | 22 | 17 | 26 | 2 | A-4(3) | ML. |
| ------ | 100 | 98 | 97 | 92 | 56 | 51 | 39 | 26 | 19 | 26 | 8 | A-4(4) | CL. |
| 100 | 71 | 62 | 59 | 52 | 30 | 28 | 22 | 14 | 10 | 26 | 6 | A-2-4(0) | GM-GC. |

TABLE 4.—*Engineering*

| Soil name and location | Parent material | Pennsylvania report number | Depth | Horizon | Moisture-density data [1] Maximum dry density | Moisture-density data [1] Optimum moisture |
|---|---|---|---|---|---|---|
| 1.5 miles E. of Shelocta and 400 feet SE. of bridge over Curry Run on U.S. 422. (Shallow) | Recent alluvium. | BJ–205<br>BJ–206 | 12 to 22<br>22 to 60 | C1<br>C2 | 121<br>123 | 12<br>12 |
| Pope fine sandy loam: 3 miles S. of Indiana; W. of U.S. 119 near Two Lick Creek. | Recent alluvium. | BH–27769<br>BH–27770 | 9 to 22<br>22 to 34 | C1<br>C2 | 115<br>115 | 13<br>14 |
| Upshur silty clay loam: 2 miles NE. of Indiana and 0.75 mile NE. of L.R. 32054 along Rt. 286. (Modal) | Shale. | BJ–4286<br>BJ–4287 | 14 to 22<br>30 to 46 | B22t<br>C | 107<br>112 | 18<br>15 |
| 2 miles NE. of Saltsburg and 400 feet W. of T. 316 on N. side of L.R. 32001. (Shallow solum) | Shale. | BH–27775<br>BH–27776 | 8 to 18<br>23 to 48 | B2<br>C | 106<br>108 | 19<br>18 |
| NE. corner of Indiana; 120 feet NE. of N. 3rd Street dead end. (Calcareous material throughout) | Shale interbedded with nodular limestone. | BH–27767<br>BH–27768 | 11 to 23<br>30 to 38 | B2<br>C | 102<br>115 | 21<br>15 |
| Weikert shaly silt loam: 1 mile N. of Commodore and 150 feet SW. of T. 856 on W. side of Rt. 286. (Modal) | Shale. | BH–27789<br>BH–27790 | 7 to 13<br>18 to 38 | B2<br>C | 111<br>(4) | 15<br>(4) |
| Wharton silt loam: 1 mile N. of Covode and 400 feet W. of U.S. 119. (Modal) | Shale. | BH–34709<br>BH–34710 | 19 to 24<br>36 to 54 | B22g<br>C1g | 101<br>109 | 22<br>17 |
| 0.5 mile SE. of Marchand and 270 feet E. of T. 660. (Modal) | Shale. | BH–34717<br>BH–34718 | 15 to 25<br>37 to 50 | B22<br>Cg | 100<br>111 | 22<br>16 |
| 3 miles W. of Jacksonville and 150 feet S. of Rt. 286. (Less clay in B2 horizon) | Shale. | BH–27773<br>BH–27774 | 9 to 17<br>37 to 50 | B21<br>Cg | 111<br>114 | 16<br>14 |
| 1.5 miles NW. of Pine Flats on N. side of T. 645. (More clay in B2 horizon) | Shale. | BH–27785<br>BH–27786 | 16 to 24<br>38 to 54 | B22<br>Cg | 104<br>115 | 19<br>14 |

[1] Based on AASHO Designation: T 99–57, Method A (*1*).

[2] Mechanical analysis according to AASHO Designation: T 88–57 (*1*). Results by this procedure may differ somewhat from results obtained by the soil survey procedure of the Soil Conservation Service (SCS). In the AASHO procedure, the fine material is analyzed by the hydrometer method, and the various grain-size fractions are calculated on the basis of all the material, including that coarser than 2 millimeters in diameter. In the SCS soil survey procedure, the fine material is analyzed by the pipette method, and the material coarser than 2 millimeters in diameter is excluded from calculations of grain-size fractions. The mechanical analysis data in this table are not suitable for naming textural classes for soil.

The depth to the seasonal high water table is the approximate distance from the surface to the free water in the soil. This estimate represents the highest level of the free water in a year of normal moisture.

The depth to bedrock refers to the approximate depth from the surface to solid rock, or noncompressible material, in its natural location.

Permeability indicates the rate at which water will move downward in soil material that is not compacted (undisturbed material). It depends largely on the texture, porosity, and structure of the soil. A rate of less than 0.2 inch per hour is slow; 0.2 to 0.63 inch, moderately slow; 0.63 to 2.0 inches, moderate; 2.0 to 6.3 inches, moderately rapid; and more than 6.3 inches, rapid.

Available moisture capacity refers to the amount of water in the soil that can be taken up by plants. Water retention is related to size of soil particles and arrangement and size of pores. The texture, structure, and organic-matter content of the soil also affect the available moisture capacity.

Reaction, the estimated degree of acidity or alkalinity, is expressed in pH value. The reaction of intensively cropped soils that have received large applications of lime over a period of several years may be higher than the estimates given in table 5.

The estimates in the columns headed "Optimum moisture for compaction" and "Maximum dry density" are for the part of the soil passing through the No. 4 sieve.

*test data*—Continued

| Mechanical analysis [2] | | | | | | | | | | Liquid limit | Plasticity index | Classification | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Percentage passing sieve— | | | | | | Percentage smaller than— | | | | | | AASHO | Unified [3] |
| 3-in. | ¾-in. | No. 4 (4.7 mm.) | No. 10 (2.0 mm.) | No. 40 (0.42 mm.) | No. 200 (0.074 mm.) | 0.05 mm. | 0.02 mm. | 0.005 mm. | 0.002 mm. | | | | |
| 100 | 91 | 70 | 58 | 44 | 22 | 20 | 16 | 9 | 6 | 23 | 3 | A-1-b(0) | SM. |
| 100 | 69 | 46 | 36 | 24 | 11 | 10 | 7 | 5 | 3 | 26 | 3 | A-1-a(0) | GW-GM. |
| ------- | ------ | -------- | 100 | 97 | 45 | 39 | 32 | 22 | 17 | 19 | NP | A-4(2) | SM. |
| ------- | ------ | -------- | 100 | 97 | 49 | 43 | 35 | 24 | 18 | 24 | 4 | A-4(3) | SM-SC. |
| ------- | 100 | 94 | 88 | 79 | 70 | 67 | 58 | 38 | 26 | 40 | 15 | A-6(9) | ML-CL. |
| ------- | 100 | 96 | 91 | 82 | 70 | 67 | 57 | 41 | 26 | 40 | 16 | A-6(9) | ML-CL. |
| ------- | ------ | -------- | 100 | 94 | 86 | 85 | 75 | 54 | 42 | 44 | 21 | A-7-6(13) | CL. |
| ------- | ------ | 100 | 97 | 89 | 78 | 77 | 68 | 49 | 40 | 47 | 23 | A-7-6(15) | CL. |
| ------- | ------ | -------- | 100 | 98 | 97 | 96 | 88 | 66 | 51 | 50 | 21 | A-7-6(14) | ML-CL. |
| ------- | 100 | 97 | 89 | 84 | 81 | 80 | 66 | 36 | 24 | 36 | 11 | A-6(8) | ML-CL. |
| 100 | 58 | 38 | 32 | 26 | 23 | 22 | 18 | 11 | 8 | 34 | 7 | A-2-4(0) | GM. |
| 100 | 47 | 25 | 20 | 16 | 14 | 13 | 10 | 7 | 5 | 35 | 7 | A-2-4(0) | GM. |
| ------- | 100 | 98 | 96 | 93 | 88 | 86 | 75 | 46 | 34 | 43 | 15 | A-7-6(11) | ML-CL. |
| 100 | 98 | 92 | 86 | 80 | 73 | 71 | 56 | 34 | 24 | 33 | 8 | A-4(8) | ML-CL. |
| ------- | ------ | 100 | 98 | 96 | 92 | 90 | 81 | 60 | 51 | 58 | 30 | A-7-6(20) | CH. |
| ------- | 100 | 95 | 85 | 72 | 65 | 64 | 55 | 35 | 25 | 36 | 12 | A-6(7) | ML-CL. |
| ------- | 100 | 94 | 87 | 79 | 70 | 69 | 56 | 34 | 25 | 34 | 9 | A-4(7) | ML-CL. |
| ------- | 100 | 96 | 88 | 79 | 70 | 68 | 56 | 32 | 23 | 31 | 9 | A-4(7) | ML-CL. |
| ------- | 100 | 98 | 97 | 94 | 88 | 87 | 76 | 49 | 37 | 41 | 14 | A-7-6(10) | ML-CL. |
| 100 | 97 | 94 | 90 | 86 | 79 | 76 | 58 | 36 | 27 | 33 | 9 | A-4(8) | ML-CL. |

[3] Soil Conservation Service and Bureau of Public Roads have agreed to consider that all soils having plasticity indexes within two points of A-line are to be given a borderline classification. Examples of borderline classifications obtained by this use are ML-CL and MH-CH.

[4] Amount of material passing No. 4 sieve insufficient for moisture-density test.

[5] Laboratory test data not corrected for 4.5 percent of sample that was larger than 3 inches.

[6] Laboratory test data not corrected for 17 percent of sample that was larger than 3 inches.

[7] NP=Nonplastic.

A soil having large amounts of material greater than ¼ inch in diameter would have a higher maximum dry density and a lower optimum moisture when the total sample is compacted at the construction site.

The shrink-swell potential indicates the volume change to be expected with a change in moisture content; that is, shrinking of the soil when it dries and swelling when it takes up moisture. Ratings are *high*, *moderate*, or *low*. They were estimated primarily on the basis of the amount and type of clay in the soil.

Dispersion refers to the degree to which and the speed at which soil structure breaks down in water. A dispersed soil is highly erodible. The estimates are based on experience with the soils in the county.

Flood hazard, which significantly affects the engineering uses of soils, is not shown in table 5. The Atkins, Philo, and Pope soils are all subject to flooding. The effect of this on their suitability for specified engineering purposes is reflected in table 6.

## Interpretation of the Soils for Engineering

Table 6 (p. 44–47) gives for each soil series, suitability ratings for specific purposes and soil features that limit suitability for engineering structures that help conserve soil and water on farmlands. The miscellaneous land types are excluded from this table because of the variability of their properties.

TABLE 5.—*Estimated engineering*

[Estimates of some properties are not given for the uppermost layer, because the

| Soil series and map symbols | Depth to— | | Depth from surface (typical profile) | USDA texture | Engineering classification | | Percentage passing sieve— | |
|---|---|---|---|---|---|---|---|---|
| | Seasonal high water table | Bedrock | | | Unified | AASHO | No. 4 (4.7 mm.) | No. 10 (2.0 mm.) |
| | *Feet* | *Feet* | *Inches* | | | | | |
| Allegheny (AhA, AhB2, AhC2). | 10+ | 4 to 20 | 0 to 36 | Silt loam | ML | A-4 | 90 to 100 | 80 to 90 |
| | | | 36 to 120 | Gravelly silty clay loam. | CL | A-4 | 75 to 90 | 70 to 90 |
| Armagh (ArA, ArB2) | 0 | 3 to 5 | 0 to 7 | Silt loam | | | | |
| | | | 7 to 28 | Silty clay loam to silty clay. | ML or CL | A-7 | 95 to 100 | 90 to 100 |
| | | | 28 to 45 | Silty clay loam | ML or CL | A-4 or A-6. | 85 to 95 | 80 to 85 |
| Atkins (At) | 0 | 3 to 10 | 0 to 8 | Silt loam | | | | |
| | | | 8 to 37 | Silt loam to silty clay loam. | ML or CL | A-4 | 90 to 100 | 85 to 100 |
| Brinkerton (BkA, BkB2, BnA, BnB, BsB, BtB). | 0 | 4 to 20 | 0 to 8 | Silt loam | | | | |
| | | | 8 to 34 | Silty clay loam | ML or MH-CH. | A-4 or A-7. | 90 to 100 | 90 to 100 |
| | | | 34 to 40 | Silty clay loam | SM-SC or CL. | A-4 or A-6. | 90 to 100 | 85 to 100 |
| Cavode (CaA, CaB2, CaC2, CaD2, CcC3, CdB, CdC). | 1 | 2½ to 6 | 0 to 6 | Silt loam | | | | |
| | | | 6 to 37 | Silty clay loam | ML-CL | A-7 | 95 to 100 | 95 to 100 |
| | | | 37 to 45 | Silt loam | ML-CL or SM. | A-4 or A-7. | 75 to 85 | 65 to 85 |
| Clarksburg (CkB2, CkC2) | 1½ | 3 to 20 | 0 to 9 | Silt loam | ML | A-4 | 70 to 80 | 65 to 75 |
| | | | 9 to 20 | Silty clay loam | ML-CL | A-6 | 95 to 100 | 95 to 100 |
| | | | 20 to 38 | Clay loam | ML-CL | A-6 | 90 to 100 | 85 to 100 |
| Clymer (ClA2, ClB2, ClC2, CmB, CmD). | (1) | 3 to 4½ | 0 to 8 | Channery loam | | | | |
| | | | 8 to 36 | Channery loam to very channery sandy loam. | GM-GC | A-2 or A-4. | 55 to 70 | 55 to 65 |
| | | | 36 to 42 | Weathered sandstone. | GM-GC | A-1 | 30 to 50 | 25 to 45 |
| Cookport (CoA, CoB2, CoC2, CpB, CpC). | 1 | 2½ to 4 | 0 to 10 | Loam | | | | |
| | | | 10 to 21 | Loam to clay loam | CL or SM | A-4 | 70 to 95 | 70 to 90 |
| | | | 21 to 39 | Channery silt loam. | CL or SM | A-2, A-4. | 75 to 85 | 70 to 90 |
| Dekalb (DaA2, DaB2, DaC2, DbB, DgB, DgD, DgF, DkD2, DrD). (For properties of Gilpin part of DgB, DgD, and DgF, see Gilpin series; for properties of Ramsey part of DkD2 and DrD, see Ramsey series.) | (1) | 1½ | 0 to 7 | Channery sandy loam. | | | | |
| | | | 7 to 23 | Channery loam | SM-SC | A-4 | 75 to 85 | 70 to 80 |
| | | | 23 to 36 | Weathered sandstone. | GM-GC | A-2 | 45 to 55 | 45 to 55 |
| Ernest (ErA2, ErB2, ErB3, ErC2, ErC3, ErD2, EsB, EsC). | 1½ | 3 to 20 | 0 to 9 | Silt loam | | | | |
| | | | 9 to 35 | Silty clay loam | ML-CL | A-7 | 95 to 100 | 80 to 95 |
| | | | 35 to 52 | Loam | ML-CL or GM-GC. | A-2 or A-6. | 60 to 95 | 60 to 85 |

See footnote at end of table.

*properties of soils*

material in this layer generally is not suitable for use in many engineering structures]

| Percentage passing sieve—Continued: No. 40 (0.42 mm.) | Percentage passing sieve—Continued: No. 200 (0.074 mm.) | Permeability | Available moisture capacity | Reaction | Optimum moisture for compaction | Maximum dry density | Shrink-swell potential | Dispersion | Corrosivity (steel) |
|---|---|---|---|---|---|---|---|---|---|
| | | *Inches per hour* | *Inches per inch of soil* | *pH* | *Percent* | *Pounds per cubic foot* | | | |
| 65 to 85 | 60 to 95 | 0.2 to 0.63 | 0.19 | 5.0 to 6.5 | 15 to 18 | 107 to 115 | Low | Low | Low. |
| 60 to 80 | 50 to 75 | 0.63 to 2.0 | .19 | 4.8 to 5.2 | 12 to 16 | 110 to 125 | Low | Low | Low. |
| ---------- | ---------- | 2.0 to 6.3 | .18 | 5.0 to 6.0 | ---------- | ---------- | Low or moderate. | High | High. |
| 70 to 90 | 75 to 85 | 0.2 to 0.63 | .17 | 4.5 to 4.9 | 14 to 20 | 103 to 113 | Moderate or high. | High | High. |
| 65 to 75 | 65 to 75 | <0.2 | .08 | 4.8 to 5.4 | 12 to 17 | 109 to 118 | Moderate | High | High. |
| ---------- | ---------- | 2.0 to 6.3 | .19 | 5.0 to 6.2 | ---------- | ---------- | Low | Low | High. |
| 80 to 100 | 60 to 85 | 0.2 to 6.3 | .17 | 5.0 to 5.6 | 17 to 19 | 103 to 110 | Moderate | Low | High. |
| ---------- | ---------- | 2.0 to 6.3 | .21 | 5.0 to 6.6 | ---------- | ---------- | Low | Low | High. |
| 75 to 95 | 65 to 95 | 0.2 to 0.63 | .19 | 4.8 to 5.4 | 17 to 20 | 100 to 109 | Moderate | Moderate | High. |
| 85 to 95 | 40 to 85 | <0.2 | .10 | 5.0 to 6.0 | 16 to 18 | 104 to 110 | Moderate | Moderate | High. |
| ---------- | ---------- | 2.0 to 6.3 | .15 | 4.8 to 6.5 | ---------- | ---------- | Low or moderate. | High | Moderate. |
| 85 to 95 | 65 to 90 | 0.2 to 0.63 | .15 | 4.8 to 5.8 | 18 to 20 | 96 to 100 | Moderate | High | Moderate. |
| 50 to 70 | 40 to 70 | <0.2 | .15 | 4.0 to 5.2 | 14 to 16 | 110 to 117 | Moderate | High | High. |
| 60 to 70 | 60 to 70 | 2.0 to 6.3 | .20 | 6.0 to 7.2 | 15 to 18 | 107 to 115 | Low | Low | Moderate. |
| 80 to 90 | 80 to 90 | 0.2 to 0.63 | .15 | 5.9 to 6.8 | 16 to 19 | 101 to 109 | Moderate | Moderate | Moderate. |
| 75 to 85 | 65 to 75 | <0.2 | .15 | 6.2 to 6.5 | 16 to 20 | 105 to 110 | Moderate | Moderate | Moderate. |
| ---------- | ---------- | >6.3 | .17 | 4.8 to 6.2 | ---------- | ---------- | Low | Low | Low. |
| 45 to 60 | 30 to 45 | 2.0 to 6.3 | .15 | 4.6 to 5.5 | 12 to 15 | 113 to 121 | Low | Low | Low. |
| 20 to 35 | 15 to 25 | 2.0 to 6.3 | .10 | 4.0 to 5.4 | 12 to 14 | 116 to 120 | Low | Low | Low. |
| ---------- | ---------- | 2.0 to 6.3 | .20 | 5.6 to 6.2 | ---------- | ---------- | Low | Moderate | Moderate. |
| 65 to 85 | 40 to 70 | 0.63 to 2.0 | .15 | 4.6 to 5.9 | 11 to 13 | 110 to 115 | Low | Moderate | Moderate. |
| 55 to 70 | 30 to 60 | 0.2 to 0.63 | .12 | 4.8 to 5.2 | 13 to 15 | 112 to 116 | Low | Moderate | Moderate. |
| ---------- | ---------- | >6.3 | .15 | 4.0 to 6.5 | ---------- | ---------- | Low | Low | Low. |
| 50 to 70 | 35 to 45 | 2.0 to 6.3 | .10 | 4.0 to 6.3 | 12 to 14 | 115 to 120 | Low | Low | Low. |
| 30 to 45 | 25 to 35 | 2.0 to 6.3 | .10 | 4.0 to 5.5 | 11 to 13 | 120 to 125 | Low | Low | Low. |
| ---------- | ---------- | 2.0 to 6.3 | .20 | 4.8 to 6.2 | ---------- | ---------- | Low | Low | Moderate. |
| 80 to 95 | 80 to 95 | 0.63 to 2.0 | .15 | 4.8 to 5.4 | 15 to 17 | 102 to 110 | Moderate | Moderate | Moderate. |
| 55 to 75 | 35 to 70 | 0.2 to 0.63 | .15 | 4.8 to 5.1 | 12 to 15 | 115 to 120 | Moderate | Moderate | High. |

215-879—67——4

TABLE 5.—*Estimated engineering*

| Soil series and map symbols | Depth to— Seasonal high water table | Depth to— Bedrock | Depth from surface (typical profile) | USDA texture | Engineering classification Unified | Engineering classification AASHO | Percentage passing sieve— No. 4 (4.7 mm.) | Percentage passing sieve— No. 10 (2.0 mm.) |
|---|---|---|---|---|---|---|---|---|
| | *Feet* | *Feet* | *Inches* | | | | | |
| Gilpin (GcA2, GcB2, GcC2, GcD2, GnB, GnD, GpE2, GrF, GwA2, GwB2, GwC2). (For properties of Weikert part of GpE2, GrF, GwA2, GwB2, and GwC2, see Weikert series.) | (1) | 2 to 4 | 0 to 9 | Channery silt loam. | | | | |
| | | | 9 to 26 | Channery silt loam. | ML-CL | A-4 | 70 to 90 | 60 to 85 |
| | | | 26 to 30 | Partially weathered siltstone. | GM-GC | A-4 or A-2. | 35 to 50 | 25 to 50 |
| Guernsey (GyB2, GyC3) | 1½ | 2½ to 5 | 0 to 7 | Silt loam | | | | |
| | | | 7 to 48 | Silty clay | ML-CL | A-6 | 90 to 100 | 80 to 100 |
| Monongahela (MoA2, MoB2, MoC2). | 1 | 4 to 20 | 0 to 7 | Silt loam | | | | |
| | | | 7 to 18 | Silty clay loam | ML-CL | A-4 | 95 to 100 | 85 to 100 |
| | | | 18 to 44 | Silty clay loam | ML-CL | A-4 | 90 to 100 | 70 to 95 |
| | | | 44 to 54 | Stratified beds of silt, fine sand, and clay. | SM | A-2 | 60 to 70 | 50 to 60 |
| Nolo (NoA, NoB) | 0 | 2½ to 4½ | 0 to 9 | Silt loam | | | | |
| | | | 9 to 40 | Clay loam to sandy clay loam. | ML-CL | A-6 | 85 to 95 | 75 to 95 |
| | | | 40 to 45 | Weathered sandstone. | ML-CL | A-4 | 90 to 100 | 85 to 100 |
| Philo (Ph) | 1½ | 4 to 12 | 0 to 8 | Silt loam | | | | |
| | | | 8 to 37 | Silt loam | ML-CL | A-4 | 95 to 100 | 90 to 100 |
| Pope (Pm, Po) | 2½+ | 4 to 12 | 0 to 10 | Fine sandy loam | | | | |
| | | | 10 to 52 | Very fine sandy loam. | CL, GM-GC or SM-SC. | A-4 or A-2. | 60 to 100 | 60 to 95 |
| Purdy (PuA) | 0 | 6 to 20 | 8 to 30 | Silt loam to silty clay. | ML | A-6 | 90 to 95 | 85 to 95 |
| | | | 30 to 45 | Silty clay | ML | A-6 | 90 to 95 | 85 to 95 |
| Ramsey (RcE, RdF). (For properties of Dekalb part of these units, see Dekalb series.) | (1) | ½ to 1½ | 0 to 18 | Channery sandy loam. | GM-GC | A-2 or A-4. | 45 to 55 | 45 to 55 |
| | | | 18 | Hard sandstone | | | | |
| Tygart (TrA, TrB2) | 1½ | 6 to 20 | 0 to 8 | Silt loam | | | | |
| | | | 8 to 24 | Silt loam | ML | A-6 | 85 to 95 | 85 to 95 |
| | | | 24 to 56 | Clay loam | ML or CL | A-6 | 85 to 95 | 75 to 85 |
| Upshur (UgB2, UgC2, UgC3, UgD2, UgD3, UgE3). (For properties of Gilpin part of these units, see Gilpin series.) | 3+ | 3 to 6 | 0 to 7 | Silty clay loam | | | | |
| | | | 7 to 30 | Silty clay loam | CH | A-7 | 95 to 100 | 90 to 100 |
| | | | 30 to 46 | Clay shale | CH | A-7 | 95 to 100 | 90 to 100 |

See footnote at end of table.

*properties of soils*—Continued

| Percentage passing sieve—Continued | | Permeability | Available moisture capacity | Reaction | Optimum moisture for compaction | Maximum dry density | Shrink-swell potential | Dispersion | Corrosivity (steel) |
|---|---|---|---|---|---|---|---|---|---|
| No. 40 (0.42 mm.) | No. 200 (0.074 mm.) | | | | | | | | |
| | | *Inches per hour* | *Inches per inch of soil* | *pH* | *Percent* | *Pounds per cubic foot* | | | |
| --- | --- | 2.0 to 6.3 | 0.15 | 5.0 to 6.2 | --- | --- | Low | Low | Moderate. |
| 55 to 75 | 55 to 70 | 0.63 to 2.0 | .10 | 4.6 to 5.8 | 15 to 17 | 111 to 115 | Low or moderate. | Low | Moderate. |
| 25 to 45 | 20 to 45 | 0.63 to 2.0 | .10 | 4.6 to 5.2 | 12 to 15 | 112 to 114 | Low | Low | Moderate. |
| --- | --- | 0.63 to 2.0 | .20 | 5.6 to 7.0 | --- | --- | Low or moderate. | Low | Moderate. |
| 75 to 95 | 70 to 95 | <0.2 | .15 | 5.5 to 6.0 | 14 to 23 | 106 to 110 | Moderate or high. | Moderate | Moderate. |
| --- | --- | 2.0 to 6.3 | .15 | --- | --- | --- | --- | --- | Moderate. |
| 80 to 95 | 70 to 95 | 0.63 to 2.0 | .15 | 5.3 to 6.9 | 15 to 18 | 107 to 115 | Low or moderate. | Low | Moderate. |
| 60 to 80 | 55 to 70 | 0.2 to 0.63 | .10 | 5.4 to 5.5 | 12 to 16 | 110 to 125 | Low | Low | High. |
| 30 to 50 | 10 to 20 | 0.63 to 2.0 | --- | --- | 10 to 12 | 120 to 125 | Low | Low | High. |
| --- | --- | 2.0 to 6.3 | .22 | 4.6 to 5.2 | --- | --- | Low | Low | High. |
| 80 to 90 | 55 to 80 | <0.2 | .12 | 4.4 to 5.2 | 18 to 21 | 105 to 112 | Moderate | Moderate | High. |
| 70 to 90 | 60 to 65 | 0.2 to 0.63 | .12 | 4.2 to 5.0 | 15 to 17 | 108 to 110 | Low | Low | High. |
| --- | --- | 2.0 to 6.3 | .20 | 4.8 to 6.6 | --- | --- | Low | Low | Moderate. |
| 75 to 95 | 55 to 80 | 0.63 to 2.0 | .15 | 4.4 to 5.8 | 17 to 20 | 100 to 108 | Low or moderate. | Low | Moderate. |
| --- | --- | >6.3 | .16 | 5.4 to 6.4 | --- | --- | Low | Low | Low. |
| 70 to 90 | 30 to 60 | 2.0 to 6.3 | .15 | 4.8 to 5.4 | 13 to 15 | 110 to 120 | Low | Low | Low. |
| 85 to 95 | 80 to 90 | <0.2 | .15 | 4.8 to 6.6 | 14 to 20 | 104 to 116 | Moderate or high. | Moderate | High. |
| 85 to 95 | 80 to 90 | <0.2 | .10 | 4.0 to 5.2 | 12 to 18 | 100 to 120 | Moderate or high. | High | High. |
| 30 to 45 | 25 to 40 | 2.0 to 6.3 | .10 | 4.0 to 5.5 | 11 to 13 | 120 to 125 | Low | Low | Low. |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | |
| --- | --- | 0.63 to 2.0 | .20 | 5.0 to 6.5 | --- | --- | --- | --- | Moderate. |
| 75 to 95 | 70 to 80 | 0.2 to 0.63 | .15 | 5.0 to 6.0 | 13 to 17 | 106 to 113 | Moderate | Moderate | High. |
| 70 to 85 | 75 to 85 | <0.2 | .10 | 5.0 to 5.5 | 13 to 15 | 113 to 123 | Moderate or high. | High | High. |
| --- | --- | 0.2 to 0.63 | .25 | 5.3 to 6.0 | --- | --- | Moderate | Moderate | High. |
| 85 to 90 | 75 to 95 | <0.2 | .15 | 5.2 to 6.0 | 17 to 20 | 102 to 107 | High | High | High. |
| 85 to 90 | 70 to 85 | <0.2 | .15 | 5.8 to 6.8 | 15 to 18 | 108 to 115 | High | High | High. |

TABLE 5.—*Estimated engineering*

| Soil series and map symbols | Depth to— Seasonal high water table | Depth to— Bedrock | Depth from surface (typical profile) | USDA texture | Engineering classification: Unified | Engineering classification: AASHO | Percentage passing sieve— No. 4 (4.7 mm.) | Percentage passing sieve— No. 10 (2.0 mm.) |
|---|---|---|---|---|---|---|---|---|
| | *Feet* | *Feet* | *Inches* | | | | | |
| Vandergrift (VaB2, VaC2) | 1 | 4 to 12 | 0 to 7 | Silt loam | | | | |
| | | | 7 to 36 | Silty clay | CL or CH | A-7 | 95 to 100 | 90 to 100 |
| | | | 36 to 46 | Soft clay shale | CH | A-7 | 95 to 100 | 90 to 100 |
| Weikert (WgB3, WgC3, WkD2, WkD3, WkF2, WkF3. (For properties of Gilpin part of these units, see Gilpin series.) | ([1]) | 1 to 2 | 0 to 7 | Shaly silt loam | | | | |
| | | | 7 to 18 | Very shaly silt loam. | GM-GC | A-2 | 35 to 45 | 25 to 40 |
| | | | 18 to 48 | Weathered shale | GM-GC | A-2 | 20 to 30 | 15 to 25 |
| Westmoreland (WmB2, WmC2, WmD3). | ([1]) | 2 to 4 | 0 to 8 | Silt loam | | | | |
| | | | 8 to 26 | Silty clay loam | ML-CL | A-6 | 85 to 90 | 80 to 90 |
| | | | 26 to 40 | Soft shale | GC | A-2 | 20 to 40 | 15 to 35 |
| Wharton (WrA, WrB2, WrC2, WrC3, WrD2). | 1½ | 3 to 6 | 0 to 10 | Silt loam | | | | |
| | | | 10 to 37 | Silty clay loam | ML-CL | A-7 | 95 to 100 | 95 to 100 |
| | | | 37 to 50 | Weathered clay shale. | ML-CL | A-4 | 90 to 95 | 80 to 90 |

[1] Depth to the water table cannot be estimated because bedrock generally is near the surface.

The suitability of a soil as a source of topsoil was estimated after considering texture, structure, content of organic matter, and content of coarse material.

The suitability of a soil as a source of road fill was estimated after taking into account compaction characteristics, shear strength, shrink-swell potential, and bearing capacity.

Factors considered in estimating suitability for highways include high water table, flooding, seepage, stones, unstable slopes, and susceptibility to frost action.

Shallowness, a hardpan, stones, and seepage limit the suitability of a soil for terraces, diversions, and waterways. Erodibility of the soil and difficulty in establishing vegetation interfere with the establishment of waterways.

Acidity, a high content of organic matter, and sulfate and chloride salts increase the corrosivity of a soil. These soil features, therefore, affect the construction and maintenance of pipelines.

The interpretations in the column headed "Farm ponds (reservoir area)" are for undisturbed soil material, and those in the column headed "Dams, dikes, and levees (embankment)" are for disturbed soil material. These interpretations are helpful in estimating the suitability of a soil for construction of lagoons and sedimentation pools.

Slow permeability, a high water table, and seepage affect the construction of an agricultural drainage system.

## Selected Nonfarm Uses of the Soils

In recent years, a significant part of the county's population has shifted from the cities to suburban or rural areas. Many houses have been built along major highways, and much former farmland has been converted to housing developments, especially near Indiana, Homer City, Blairsville, and Saltsburg. This new housing, for the most part, depends on wells for water supply and on septic tanks for sewage disposal.

Features that affect the use of soils for purposes other than farming include depth to bedrock, internal drainage, depth to water table, susceptibility to flooding, stability, stoniness, and degree of slope. This soil survey can be used in planning future housing and in solving problems that arise as use of the land changes, but it does not eliminate the need for investigation at the site of a planned development.

In this section the soils in the county have been placed in community development groups on the basis of the soil features that affect nonfarm uses. The soils in each group are referred to by series name, but this does not mean that all the soils of a series are in the particular group. Refer to the Guide to Mapping Units at the back of this report for the names of the mapping units and the community development group in which each has been placed. In table 7, the limitations of the soils for specific nonfarm uses are rated *slight*, *moderate*, or

*properties of soils*—Continued

| Percentage passing sieve—Continued | | Permeability | Available moisture capacity | Reaction | Optimum moisture for compaction | Maximum dry density | Shrink-swell potential | Dispersion | Corrosivity (steel) |
|---|---|---|---|---|---|---|---|---|---|
| No. 40 (0.42 mm.) | No. 200 (0.074 mm.) | | | | | | | | |
| | | *Inches per hour* | *Inches per inch of soil* | *pH* | *Percent* | *Pounds per cubic foot* | | | |
| ---------- | ---------- | 2.0 to 6.3 | 0.22 | 6.0 to 7.0 | ---------- | ---------- | Low or moderate. | Moderate | Moderate. |
| 85 to 90 | 65 to 85 | $<0.2$ | .13 | 5.5 to 7.0 | 15 to 19 | 104 to 116 | High | High | Moderate. |
| 80 to 90 | 50 to 70 | $<0.2$ | .11 | 6.0 to 7.0 | 15 to 20 | 100 to 110 | High | High | High. |
| ---------- | ---------- | $>6.2$ | .15 | 5.2 to 6.6 | ---------- | ---------- | Low | Low | Low. |
| ---------- | 15 to 30 | 2.0 to 6.3 | .10 | 4.8 to 5.4 | 12 to 15 | 110 to 115 | Low | Low | Low. |
| ---------- | 10 to 20 | 2.0 to 6.3 | ---------- | 4.8 to 5.4 | 16 to 20 | 100 to 105 | Low | Low | Low. |
| ---------- | ---------- | 2.0 to 6.3 | .15 | 5.5 to 7.0 | ---------- | ---------- | Low | Low | High. |
| 70 to 90 | 70 to 80 | 0.2 to 0.63 | .12 | 5.6 to 6.5 | 16 to 18 | 110 to 112 | Low or moderate. | Low | High. |
| 15 to 30 | 15 to 30 | 0.63 to 2.0 | .10 | 5.0 to 6.0 | 12 to 16 | 115 to 122 | Low | Low | Moderate. |
| ---------- | ---------- | 2.0 to 6.3 | .20 | 5.2 to 6.5 | ---------- | ---------- | Low | Low | Moderate. |
| 80 to 90 | 85 to 95 | 0.63 to 2.0 | .15 | 4.6 to 5.2 | 19 to 22 | 100 to 105 | Moderate or high. | Moderate | Moderate. |
| 70 to 90 | 65 to 75 | 0.2 to 0.63 | .15 | 4.6 to 5.2 | 15 to 17 | 100 to 114 | Moderate | Moderate | High. |

*severe,* and the chief limiting properties are given. Location, in relation to established centers or transportation lines, and other economic factors are important and will affect the selection of a development site. These factors, however, were not considered in estimating the degrees of limitation shown in table 7.

### Community development group 1

This group consists of level to gently sloping, deep, well-drained, moderately permeable Allegheny soils and rapidly permeable Clymer soils. Of the soils in Indiana County, these soils have the fewest natural limitations for residential, commercial, and industrial development. They are also good for agriculture.

These soils have good surface drainage and are free from a seasonal high water table. They are a good filtration medium for sewage and therefore are suitable for septic tanks in low-density and medium-density housing areas. Infiltration of large amounts of waste may result in the contamination of shallow wells because permeability in the substratum is moderate to rapid.

Slope is favorable for construction. The deepest Allegheny soils may require careful investigation if large buildings are planned.

### Community development group 2

This group consists of sloping and moderately steep, well-drained, deep, moderately to rapidly permeable Allegheny soils and rapidly permeable Clymer soils. These soils are satisfactory for low- or medium-density residential development, but are somewhat steep for extensive commercial, industrial, or institutional development.

Natural surface drainage is good, and the water table is not seasonally high. In new housing, runoff and gully erosion may be problems. Except on the steeper slopes, where soil creep may occur, sites for building foundations are generally good. Under normal conditions, effluent from septic tanks can be disposed of satisfactorily.

### Community development group 3

In this group are level to sloping, deep and moderately deep, well-drained, permeable Clymer, Dekalb, Gilpin, and Westmoreland soils. The Dekalb soil is the most shallow and the most expensive to excavate.

Surface drainage is good, and permeability is moderate to rapid. The water table is never seasonally high. Depth to sandstone, hard shale, or limestone ranges from 1 foot to 4½ feet.

These soils are generally good for building foundations, and slopes are no deterrent to construction. The Gilpin and Westmoreland soils require careful investigation because the underlying rock may be interbedded with clay shale. In most places these soils are not deep enough to accommodate large amounts of effluent from septic tanks. The Clymer soil is the best in the group for septic tanks, but it is very stony, and the many stones would add to the cost of excavation.

TABLE 6.—*Engineering*

| Soil series and map symbols | Suitability for winter grading | Susceptibility to frost action | Suitability as source of— | | Soil features affecting engineering practices | |
|---|---|---|---|---|---|---|
| | | | Topsoil | Road fill | Highway location | Terraces, diversions, and waterways |
| Allegheny (AhA, AhB2, AhC2) | Unsuitable | Low | Good | Fair | Stratification; good drainage. | Moderately slow or moderate permeability. |
| Armagh (ArA, ArB2) | Unsuitable | High | Fair | Poor | Claypan; high water table. | Erodible; shallow to claypan. |
| Atkins (At) | Unsuitable | High | Good | Poor | High water table; flooding. | Flooding |
| Brinkerton (BkA, BkB2, BsB) | Unsuitable | High | Good | Fair | High water table; high erodibility. | Erodible; shallow to hardpan; stony. |
| Brinkerton (very wet) (BnA, BnB, BtB). | Unsuitable | High | Good | Fair | High water table; ponding; high erodibility. | Erodible; shallow to hardpan; stony; ponding. |
| Cavode (CaA, CaB2, CaC2, CaD2, CcC3, CdB, CdC). | Unsuitable | High | Fair | Poor | Seasonal high water table; erodible. | Claypan; seasonal high water table. |
| Clarksburg (CkB2, CkC2) | Unsuitable | Moderate | Good | Fair | Seasonal high water table; erodible. | Seasonal high water table; erodible. |
| Clymer (ClA2, ClB2, ClC2, CmB, CmD). | Suitable | Moderate | Fair | Good | Good drainage | Good drainage; stony |
| Cookport (CoA, CoB2, CoC2, CpB, CpC). | Unsuitable | Moderate | Fair | Fair | Seasonal high water table; somewhat poor drainage. | Fragipan; stony |
| Dekalb (DaA2, DaB2, DaC2, DbB, DgB, DgD, DgF, DkD2, DrD). (For Gilpin part of DgB, DgD, and DgF, see Gilpin series; for Ramsey part of DkD2 and DrD, see Ramsey series.) | Suitable | Low | Fair | Good | Good drainage | Good drainage; stony |
| Ernest (ErA2, ErB2, ErB3, ErC2, ErC3, ErD2, EsB, EsC). | Unsuitable | Moderate | Good | Fair | Seasonal high water table; somewhat poor drainage. | Stony; somewhat poor drainage. |
| Gilpin (GcA2, GcB2, GcC2, GcD2, GnB, GnD, GpE2, GrF, GwA2, GwB2, GwC2). (For Weikert part of GpE2, GrF, GwA2, GwB2, and GwC2, see Weikert series.) | Suitable | Moderate | Fair | Good | Good drainage | Shallow to bedrock; stony; good drainage. |

See footnote at end of table.

*interpretations*

| Soil features affecting engineering practices—Continued | | | | |
|---|---|---|---|---|
| Construction and maintenance of pipelines | Farm ponds (reservoir area) | Dams, dikes, and levees (embankment) | Agricultural drainage | Irrigation (sprinkler system) |
| Good drainage | Stratification | Underlain by stratified material; stability and slow permeability when properly controlled. | Good drainage; stratification at a depth of 3 to 5 feet. | No undesirable features. |
| High water table; less than 5 feet to bedrock; instability. | Less than 5 feet to bedrock; slow permeability. | Instability; wetness; slow permeability when compacted. | Slow permeability | Shallow to claypan; slow permeability; high water table. |
| Flooding; high water table. | Underlain by stratified material. | Instability; wetness; slow permeability when compacted; flooding; underlain by stratified material. | Flooding; high water table. | High water table. |
| High water table | Slow permeability; deep to bedrock. | High water table; slow permeability when compacted; stony. | High water table; slow permeability; stony. | Seasonal high water table. |
| High water table | Slow permeability; deep to bedrock. | High water table; slow permeability when compacted; stony. | High water table; slow permeability; stony. | High water table. |
| Seasonal high water table. | No undesirable features | Instability | Slow permeability; seepage. | Slow infiltration; seasonal high water table. |
| Seasonal high water table. | Deep to bedrock; slow permeability; seasonal high water table. | Slow permeability when compacted; stability when properly controlled. | Seasonal high water table. | Seasonal high water table. |
| Moderately shallow to bedrock; good drainage. | Moderately deep to bedrock; moderately rapid permeability; good drainage. | Stability; moderately rapid permeability; stony. | Good drainage; stony | No undesirable features. |
| Seasonal high water table; moderately shallow to bedrock. | Shallow or moderately deep to bedrock. | Slow permeability when compacted; stability. | Seasonal high water table; stony; fragipan. | Seasonal high water table. |
| Good drainage; shallow to bedrock. | Moderate to rapid permeability; stony; shallow to bedrock. | Stability when compacted; moderate to rapid permeability; stony. | Good drainage; stony | Low water-holding capacity. |
| Deep to bedrock; somewhat poor drainage. | Moderate permeability; deep to bedrock. | Stability and slow permeability when properly controlled. | Moderate permeability; stony. | Moderate permeability; high water-holding capacity. |
| Shallow to bedrock; good drainage. | Good drainage; stony; shallow to bedrock. | Stability and slow permeability when compacted. | Good drainage | Moderate permeability. |

TABLE 6.—*Engineering*

| Soil series and map symbols | Suitability for winter grading | Susceptibility to frost action | Suitability as source of— | | Soil features affecting engineering practices | |
|---|---|---|---|---|---|---|
| | | | Topsoil | Road fill | Highway location | Terraces, diversions, and waterways |
| Guernsey (GyB2, GyC3) | Unsuitable | High | Fair | Poor | Seasonal high water table. | Erodible; soil slips |
| Monongahela (MoA2, MoB2, MoC2). | Unsuitable | Moderate | Good | Fair | Seasonal high water table; stratification. | Seasonal high water table; fragipan; stony. |
| Nolo (NoA, NoB) | Unsuitable | High | Poor | Poor | High water table | High water table; hardpan. |
| Philo (Ph) | Unsuitable | Moderate | Good | Fair | Flooding; stratification | Flooding |
| Pope (Pm, Po) | Suitable | Low | Good | Good | Flooding; stratification | Deep to bedrock; good drainage; flooding. |
| Purdy (PuA) | Unsuitable | High | Good | Poor | High water table; erodible. | Poor drainage; erodible |
| Ramsey (RcE, RdF) (For Dekalb part of these units, see Dekalb series.) | Suitable | Low | Fair | Good | Shallow to bedrock; good drainage. | Good drainage; stony; shallow to bedrock. |
| Tygart (TrA, TrB2) | Unsuitable | Moderate | Good | Poor | Seasonal high water table; erodible. | Seasonal high water table; erodible. |
| Upshur (UgB2, UgC2, UgC3, UgD2, UgD3, UgE3). (For Gilpin part of these units, see Gilpin series.) | Unsuitable | High | Fair | Poor | Erodible; high bearing strength when dry. | Erodible |
| Vandergrift (VaB2, VaC2) | Unsuitable | Moderate | Good | Poor | Seasonal high water table. | Seasonal high water table; erodible. |
| Weikert (WgB3, WgC3, WkD2, WkD3, WkF2, WkF3). (For Gilpin part of these units, see Gilpin series.) | Suitable | Low | Poor | Good | Shallow to bedrock; good drainage. | Shallow to bedrock |
| Westmoreland (WmB2, WmC2, WmD3). | Suitable | Moderate | Good | Fair | Good drainage; erodible. | Erodible |
| Wharton (WrA, WrB2, WrC2, WrC3, WrD2). | Unsuitable | Moderate | Good | Fair | Erodible | Claypan; erodible |

[1] Because of limestone influence, these soils may need chemical treatment to be impermeable. Generally, sodium polyphosphate is applied to a limestone soil to disperse the soil particles and thus form an impermeable blanket.

*interpretations*—Continued

| Soil features affecting engineering practices—Continued | | | | |
|---|---|---|---|---|
| Construction and maintenance of pipelines | Farm ponds (reservoir area) | Dams, dikes, and levees (embankment) | Agricultural drainage | Irrigation (sprinkler system) |
| Seasonal high water table; moderately shallow to bedrock. | Moderately deep to bedrock; slow permeability. | Stability when well compacted; slow permeability when compacted.[1] | Seasonal high water table. | Slow or moderately slow permeability; high water-holding capacity. |
| Seasonal high water table. | Stratification; seasonal high water table. | Underlain by stratified material; stability and slow permeability when properly controlled. | Seasonal high water table; fragipan; stratification at a depth of 3 to 5 feet. | Moderate or moderately rapid permeability. |
| High water table | High water table | Instability; high water table; low permeability. | High water table; hardpan. | Seasonal high water table. |
| Flooding; underlain by stratified material. | Stratification; moderate to rapid permeability; flooding. | Underlain by stratified material; stability and slow permeability when properly controlled. | Stratification; flooding | No undesirable features. |
| Deep to bedrock; good drainage. | Moderately rapid or rapid permeability; stratification. | Stability; moderately rapid or rapid permeability; underlain by stratified material. | Good drainage; stratification; flooding. | Moderately rapid or rapid permeability. |
| High water table; deep to bedrock. | High water table; slow permeability. | Instability; slow permeability. | High water table; slow permeability. | High water table; slow permeability. |
| Good drainage; shallow to bedrock. | Rapid permeability; stony; shallow to bedrock. | Stability when compacted; rapid permeability; stony; shallow to bedrock. | Good drainage; stony | Low water-holding capacity. |
| Seasonal high water table; deep to bedrock. | Slow permeability; seasonal high water table. | Instability; slow permeability. | Seasonal high water table. | Seasonal high water table. |
| Moderately shallow to bedrock. | Slow permeability | Instability; slow permeability. | Slow permeability | Slow permeability; high water-holding capacity. |
| Seasonal high water table. | Slow permeability; seasonal high water table. | Instability; slow permeability.[1] | Slow permeability; seasonal high water table. | Seasonal high water table. |
| Shallow to bedrock; good drainage. | Good drainage; shallow to bedrock. | Stability; moderately rapid permeability; shallow to bedrock. | Good drainage | Good drainage; moderately rapid permeability. |
| Moderately shallow to bedrock. | Moderate permeability | Stability and slow permeability when properly controlled. | Moderate permeability | Moderate permeability. |
| Moderately shallow to bedrock. | Slow permeability | Instability; slow permeability. | Slow permeability; claypan; seepage. | Slow permeability; claypan; moderate water-holding capacity. |

TABLE 7.—*Degree of soil limitations for selected*

| Soil series and map symbols | Community development group | Degree and cause of limitation for— | | | |
|---|---|---|---|---|---|
| | | Disposal of effluent from septic tanks | Sewage lagoons | Residence location | Landscaping and lawns |
| Allegheny: | | | | | |
| AhA | 1 | Slight | Moderate; moderate permeability. | Slight | Slight |
| AhB2 | 1 | Slight | Moderate; moderate permeability. | Slight | Slight |
| AhC2 | 2 | Moderate; slope, moderate permeability. | Severe; slope | Moderate; slope | Moderate; slope |
| Armagh: | | | | | |
| ArA | 14 | Severe; high water table, slow permeability. | Slight | Severe; high water table. | Severe; high water table. |
| ArB2 | 14 | Sevére; high water table. | Moderate; slope | Severe; high water table. | Severe; high water table. |
| Atkins: | | | | | |
| At | 15 | Severe; flooding | Severe; flooding | Severe; flooding | Severe; wetness |
| Brinkerton: | | | | | |
| BkA | 14 | Severe; high water table. | Slight | Severe; high water table. | Severe; wetness |
| BkB2 | 14 | Severe; high water table. | Moderate | Severe; high water table. | Severe; wetness |
| BnA, BnB | 14 | Severe; high water table. | Slight to moderate; slope. | Severe; high water table. | Severe; high water table. |
| BsB | 14 | Severe; high water table. | Moderate; slope | Severe; high water table. | Severe; high water table. |
| BtB | 14 | Severe; high water table. | Moderate; slope | Severe; high water table. | Severe; high water table. |
| Cavode: | | | | | |
| CaA | 14 | Severe; high water table. | Slight | Severe; high water table. | Moderate; high water table. |
| CaB2 | 14 | Severe; high water table. | Moderate; slope | Severe; high water table. | Moderate; high water table. |
| CaC2 | 14 | Severe; slope | Severe; slope | Severe; high water table. | Moderate; high water table, slope. |
| CaD2 | 14 | Severe; slope | Severe; slope | Severe; high water table. | Severe; slope |
| CcC3 | 14 | Severe; high water table. | Severe; slope | Severe; high water table. | Severe; eroded, slope. |
| CdB | 14 | Severe; high water table. | Moderate; slope | Severe; high water table. | Moderate; high water table, stoniness. |
| CdC | 14 | Severe; slope | Severe; slope | Severe; high water table. | Moderate to severe; high water table, stoniness, slope. |
| Clarksburg: | | | | | |
| CkB2 | 12 | Severe; seasonal high water table. | Moderate; slope | Moderate; seasonal high water table. | Slight |
| CkC2 | 13 | Severe; seasonal high water table. | Severe; slope | Moderate; seasonal high water table. | Moderate; seasonal high water table. |
| Clymer: | | | | | |
| ClA2 | 1 | Slight | Severe; moderately rapid permeability. | Moderate; moderate depth to rock. | Slight |
| ClB2 | 1 | Moderate; slope | Severe; moderately rapid permeability. | Moderate; slope, moderate depth to rock. | Moderate; slope |
| ClC2 | 2 | Severe; slope | Severe; slope | Moderate; slope | Moderate; slope |
| CmB | 3 | Moderate; slope, stoniness. | Severe; moderately rapid permeability. | Moderate; stoniness, slope. | Moderate to severe; stoniness. |
| CmD | 4 | Severe; slope | Severe; slope | Moderate to severe; slope. | Moderate to severe; slope, stoniness. |
| Cookport: | | | | | |
| CoA | 12 | Severe; seasonal high water table. | Slight | Moderate; seasonal high water table. | Slight |
| CoB2, CpB | 12 | Severe; seasonal high water table. | Moderate; moderate depth to rock. | Moderate; seasonal high water table. | Slight |
| CoC2, CpC | 13 | Severe; seasonal high water table. | Severe; slope | Moderate; seasonal high water table. | Moderate; slope |

*nonfarm uses, and chief limiting properties*

| Degree and cause of limitation for—Continued | | | | |
|---|---|---|---|---|
| Streets and parking lots | Athletic fields | Parks and play areas | Sanitary land fill | Cemeteries |
| Slight | Slight | Slight | Slight | Slight. |
| Moderate; slope | Moderate; slope | Slight | Slight | Slight. |
| Severe; slope | Severe; slope | Moderate; slope | Moderate; slope | Moderate; slope. |
| Severe; high water table | Severe; high water table. | Severe; high water table | Severe; high water table | Severe; high water table. |
| Severe; high water table | Severe; high water table. | Severe; high water table | Severe; high water table | Severe; high water table. |
| Severe; high water table | Severe; high water table. | Severe; high water table, flooding. | Severe; high water table, flooding. | Severe; flooding, high water table. |
| Severe; high water table | Severe; high water table. | Severe; high water table | Severe; high water table | Severe; high water table. |
| Severe; high water table | Severe; high water table. | Severe; high water table | Severe; high water table | Severe; high water table. |
| Severe; high water table | Severe; high water table. | Severe; high water table | Severe; high water table | Severe; high water table. |
| Severe; high water table | Severe; high water table. | Severe; high water table | Severe; high water table | Severe; high water table. |
| Severe; high water table | Severe; high water table. | Severe; high water table | Severe; high water table | Severe; high water table. |
| Moderate; high water table. | Severe; high water table. | Moderate; high water table. | Severe; high water table | Severe; high water table. |
| Moderate; high water table. | Severe; high water table. | Moderate; high water table. | Severe; high water table | Severe; high water table. |
| Severe; high water table, slope. | Severe; high water table. | Moderate; high water table, slope. | Severe; high water table | Severe; high water table. |
| Severe; slope | Severe; slope | Severe; slope | Severe; high water table | Severe; high water table. |
| Severe; high water table | Severe; high water table. | Moderate; slope | Severe; high water table | Severe; high water table. |
| Moderate; high water table. | Severe; high water table. | Moderate; high water table. | Severe; high water table | Severe; high water table. |
| Severe; high water table, slope. | Severe; high water table. | Moderate to severe; slope. | Severe; high water table | Severe; high water table. |
| Moderate; seasonal high water table. | Moderate; seasonal high water table. | Slight | Severe; seasonal high water table. | Severe; seasonal high water table. |
| Severe; slope, seasonal high water table. | Severe; slope | Moderate; seasonal high water table. | Severe; seasonal high water table. | Severe; seasonal high water table. |
| Slight | Moderate; channery | Slight | Moderate; moderate depth to rock. | Moderate; moderate depth to rock. |
| Moderate to severe; slope. | Severe; slope | Moderate; slope | Moderate; moderate depth to rock. | Moderate; moderate depth to rock. |
| Severe; slope | Severe; slope | Moderate to severe; slope. | Moderate; slope | Moderate to severe; slope. |
| Moderate; stoniness, slope. | Severe; stoniness, slope. | Slight | Moderate; stoniness | Moderate; stoniness. |
| Severe; slope | Severe; slope | Moderate; slope | Severe; slope, stoniness | Severe; slope. |
| Moderate; seasonal high water table. | Moderate; seasonal high water table. | Slight | Severe; seasonal high water table. | Severe; seasonal high water table. |
| Moderate; seasonal high water table. | Moderate; slope | Slight | Severe; seasonal high water table. | Severe; seasonal high water table. |
| Severe; slope | Severe; slope | Moderate; slope | Severe; seasonal high water table. | Severe; seasonal high water table. |

TABLE 7.—*Degree of soil limitation for selected nonfarm*

| Soil series and map symbols | Community development group | Degree and cause of limitation for— | | | |
|---|---|---|---|---|---|
| | | Disposal of effluent from septic tanks | Sewage lagoons | Residence location | Landscaping and lawns |
| Dekalb: | | | | | |
| DaA2 | 3 | Severe; shallow to rock. | Severe; rapid permeability. | Severe; shallow to hard rock. | Moderate; droughty |
| DaB2 | 3 | Severe; slope, shallow to rock. | Severe: rapid permeability. | Severe; shallow to hard rock. | Moderate; droughty |
| DaC2 | 4 | Severe; shallow to rock. | Severe; slope | Severe; slope, shallow to rock. | Moderate to severe; slope. |
| DbB | 5 | Severe; shallow to rock. | Severe; rapid permeability. | Severe; shallow to rock. | Severe; very stony |
| DgB | 5 | Severe; shallow to rock. | Severe; shallow to rock. | Severe; shallow to rock. | Moderate to severe; slope, stoniness. |
| DgD, DgF | 6, 11 | Severe; slope, shallow to rock. | Severe; slope, shallow to rock. | Severe; slope, shallow to rock. | Moderate to severe; slope, stoniness. |
| DkD2, DrD | 11, 6 | Severe; slope, shallow to rock. | Severe; slope | Severe; slope, shallow to rock. | Severe; slope |
| Ernest: | | | | | |
| ErA2 | 12 | Severe; seasonal high water table. | Slight | Moderate; seasonal high water table. | Slight |
| ErB2 | 12 | Severe; seasonal high water table. | Moderate; slope | Moderate; seasonal high water table. | Slight |
| ErB3 | 12 | Severe; seasonal high water table. | Moderate; slope | Moderate; seasonal high water table. | Moderate; eroded |
| ErC2 | 13 | Severe; seasonal high water table. | Severe; slope | Moderate; seasonal high water table. | Moderate; slope |
| ErC3 | 13 | Severe; seasonal high water table, slope. | Severe; slope | Moderate; seasonal high water table, slope. | Severe; slope, eroded. |
| ErD2 | 13 | Severe; slope | Severe; slope | Moderate; seasonal high water table, slope. | Severe; slope |
| EsB | 12 | Severe; seasonal high water table. | Moderate; slope, stoniness. | Moderate; seasonal high water table, stoniness. | Moderate to severe; stoniness. |
| EsC | 13 | Severe; seasonal high water table, slope. | Severe; slope, stoniness. | Moderate; seasonal high water table, stoniness. | Moderate to severe; slope, stoniness. |
| Gilpin: | | | | | |
| GcA2 | 3 | Moderate; moderate depth to rock. | Severe; rapid permeability. | Moderate; moderate depth to rock. | Moderate; shaly, moderate depth to rock. |
| GcB2 | 3 | Severe; moderate depth to rock. | Severe; slope, rapid permeability. | Moderate; moderate depth to rock. | Moderate; shaly, moderate depth to rock. |
| GcC2 | 4 | Severe; moderate depth to rock, slope. | Severe; rapid permeability, slope. | Moderate; moderate depth to rock. | Severe; slope |
| GcD2 | 11 | Severe; slope | Severe; slope | Severe; slope | Severe; slope |
| GnB | 5 | Severe; moderate depth to rock. | Severe; moderate permeability, moderate depth to rock. | Moderate; moderate depth to rock, stoniness. | Moderate; moderate depth to rock, stoniness. |
| GnD | 6 | Severe; slope | Severe; slope | Severe; slope, stoniness | Severe; slope, stoniness |
| GpE2, GrF | 11 | Severe; shallow to rock, slope. | Severe; slope | Severe; slope | Severe; slope |
| GwA2 | 9 | Severe; shallow to rock | Severe; shallow to rock, rapid permeability. | Severe; shallow to rock | Moderate; shallow to rock. |
| GwB2 | 9 | Severe; shallow to rock | Severe; shallow to rock, rapid permeability. | Severe; shallow to rock | Moderate; shallow to rock. |
| GwC2 | 10 | Severe; shallow to rock | Severe; slope | Severe; shallow to rock | Severe; shallow to rock, slope. |
| Guernsey: | | | | | |
| GyB2 | 12 | Severe; seasonal high water table. | Moderate; slope | Severe; seasonal high water table. | Slight |
| GyC3 | 13 | Severe; seasonal high water table. | Severe; slope | Severe; seasonal high water table, slope. | Moderate; slope |
| Made land: | | | | | |
| Ma | 16 | Variable | Variable | Variable | Variable |
| Mine dumps: | | | | | |
| Md | 16 | Severe; acidity, instability. | Severe; rapid permeability. | Severe; instability | Severe; does not support vegetation. |

*uses, and chief limiting properties*—Continued

| Degree and cause of limitation for—Continued | | | | |
|---|---|---|---|---|
| Streets and parking lots | Athletic fields | Parks and play areas | Sanitary land fill | Cemeteries |
| Moderate; shallow to rock. | Moderate; shallow to rock. | Moderate; shallow to rock. | Severe; shallow | Severe; shallow to rock. |
| Severe; slope | Severe; slope | Moderate; slope | Severe; shallow to rock. | Severe; shallow to rock. |
| Severe; slope | Severe; slope | Moderate; slope | Severe; shallow to rock | Severe; shallow to rock. |
| Severe; slope | Severe; very stony | Severe; slope | Severe; very stony | Severe; shallow to rock. |
| Moderate; slope, stoniness | Moderate; shallow to rock. | Moderate; shallow to rock, stoniness. | Severe; shallow to rock | Severe; shallow to rock. |
| Severe; slope | Severe; slope | Moderate to severe; slope. | Severe; slope, shallow to rock. | Severe; slope, shallow to rock. |
| Severe; slope | Severe; slope | Severe; slope | Severe; shallow to rock | Severe; shallow to rock. |
| Moderate; seasonal high water table. | Moderate; seasonal high water table. | Slight | Severe; seasonal high water table. | Severe; seasonal high water table. |
| Moderate; seasonal high water table. | Moderate; seasonal high water table. | Slight | Severe; seasonal high water table. | Severe; seasonal high water table. |
| Moderate; slope | Moderate; slope | Slight | Severe; seasonal high water table. | Severe; seasonal high water table. |
| Severe; slope | Severe; slope | Moderate; slope | Severe; seasonal high water table. | Severe; seasonal high water table. |
| Severe; slope | Severe; slope | Moderate; slope | Severe; seasonal high water table. | Severe; seasonal high water table. |
| Severe; slope | Severe; slope | Severe; slope | Severe; slope | Severe; slope. |
| Moderate; stoniness, seasonal high water table. | Moderate; slope, stoniness. | Slight | Severe; seasonal high water table. | Severe; seasonal high water table, stoniness. |
| Severe; slope | Severe; slope | Moderate; slope | Severe; seasonal high water table. | Severe; seasonal high water table, stoniness. |
| Moderate; slope | Moderate; channery, shallow to rock. | Slight | Moderate; moderate depth to rock. | Severe; moderate depth to rock. |
| Severe; slope | Moderate to severe; slope. | Moderate; slope | Severe; moderate depth to rock. | Severe; moderate depth to rock. |
| Severe; slope | Severe; slope | Severe; slope | Severe; slope | Severe; moderate depth to rock. |
| Severe; slope | Severe; slope | Severe; slope | Severe; slope | Severe; slope. |
| Moderate; stoniness, slope. | Severe; stoniness, slope. | Slight | Severe; stoniness | Severe; stoniness. |
| Severe; slope | Severe; slope | Severe; slope | Severe; stoniness | Severe; stoniness, slope. |
| Severe; slope | Severe; slope | Severe; slope | Severe; slope | Severe; slope. |
| Moderate; shallow to rock. | Severe; shaly surface, shallow to rock. | Moderate; shallow to rock. | Severe; shallow to rock | Moderate; shallow to rock. |
| Severe; slope | Severe; slope | Moderate; shallow to rock. | Severe; shallow to rock | Moderate; shallow to rock. |
| Severe; slope | Severe; slope | Severe; slope | Severe; slope, shallow to rock. | Severe; slope, shallow to rock. |
| Moderate; seasonal high water table, slope. | Moderate; seasonal high water table. | Slight | Severe; seasonal high water table. | Severe; seasonal high water table. |
| Severe; slope | Severe; slope | Moderate; slope | Severe; seasonal high water table. | Severe; seasonal high water table. |
| Variable | Variable | Variable | Variable | Variable. |
| Severe; slope, instability | Severe; coarse fragments. | Severe; does not support vegetation. | Severe; coarse material | Severe; instability. |

TABLE 7.—*Degree of soil limitation for selected nonfarm*

| Soil series and map symbols | Community development group | Degree and cause of limitation for— | | | |
|---|---|---|---|---|---|
| | | Disposal of effluent from septic tanks | Sewage lagoons | Residence location | Landscaping and lawns |
| Monongahela: | | | | | |
| MoA2 | 12 | Severe; seasonal high water table. | Slight | Moderate; seasonal high water table. | Slight |
| MoB2 | 12 | Severe; seasonal high water table. | Moderate; slope | Moderate; seasonal high water table. | Slight |
| MoC2 | 13 | Severe; seasonal high water table. | Severe; slope | Moderate; seasonal high water table, slope. | Moderate; seasonal high water table, slope. |
| Nolo: | | | | | |
| NoA | 14 | Severe; high water table. | Slight | Severe; high water table. | Severe; high water table. |
| NoB | 14 | Severe; high water table. | Moderate; slope | Severe; high water table. | Severe; high water table. |
| Philo: | | | | | |
| Ph | 15 | Severe; flooding | Severe; flooding | Severe; flooding | Slight |
| Pope: | | | | | |
| Pm, Po | 15 | Severe; flooding | Severe; flooding | Severe; flooding | Moderate; flooding |
| Purdy: | | | | | |
| PuA | 14 | Severe; high water table. | Slight | Severe; high water table. | Severe; wetness |
| Ramsey: | | | | | |
| RcE, RdF | 11 | Severe; slope | Severe; slope | Severe; slope | Severe; slope |
| Stony land: | | | | | |
| So, Sp | 16 | Severe; stoniness, slope | Severe; stoniness, slope. | Severe; stoniness, slope. | Severe; stoniness, slope. |
| Strip mine spoil: | | | | | |
| Sr, St | 16 | Severe; instability, slope. | Severe; instability, slope. | Severe; instability, slope. | Severe; variable material, slope. |
| Tygart: | | | | | |
| TrA | 14 | Severe; slow permeability. | Slight | Moderate; seasonal high water table. | Moderate; seasonal high water table. |
| TrB2 | 14 | Severe; slow permeability. | Moderate; slope | Moderate; seasonal high water table. | Moderate; seasonal high water table. |
| Upshur: | | | | | |
| UgB2 | 7 | Severe; slow permeability. | Moderate; slope | Severe; instability | Severe; clayey subsoil |
| UgC2, UgC3, UgD2, UgD3. | 8 | Severe; slow permeability. | Severe; slope | Severe; instability | Severe; instability, clayey subsoil. |
| UgE3 | 11 | Severe; slope, permeability. | Severe; slope | Severe; instability | Severe; instability, clayey subsoil. |
| Vandergrift: | | | | | |
| VaB2 | 12 | Severe; slow permeability. | Moderate; slope | Moderate; seasonal high water table. | Moderate; seasonal high water table. |
| VaC2 | 12 | Severe; slow permeability. | Severe; slope | Moderate; seasonal high water table. | Moderate; seasonal high water table. |
| Weikert: | | | | | |
| WgB3 | 9 | Severe; shallow to rock | Severe; rapid permeability. | Moderate; shallow to rock. | Moderate; shallow to rock. |
| WgC3 | 10 | Severe; shallow to rock | Severe; slope | Moderate; shallow to rock. | Moderate; shallow to rock. |
| WkD2, WkD3 | 11 | Severe; slope, shallow to rock. | Severe; slope | Severe; slope | Severe; slope, shallow to rock. |
| WkF2, WkF3 | 11 | Severe; slope | Severe; slope | Severe; slope | Severe; slope |

*uses, and chief limiting properties*—Continued

| Degree and cause of limitation for—Continued | | | | |
|---|---|---|---|---|
| Streets and parking lots | Athletic fields | Parks and play areas | Sanitary land fill | Cemeteries |
| Moderate; seasonal high water table. | Moderate; seasonal high water table. | Slight | Moderate; seasonal high water table. | Moderate; seasonal high water table, moderately slow permeability. |
| Moderate; slope | Moderate; slope | Slight | Moderate; seasonal high water table. | Moderate; seasonal high water table, moderately slow permeability. |
| Severe; slope | Severe; slope | Moderate; slope | Moderate; seasonal high water table. | Moderate; seasonal high water table, moderately slow permeability. |
| Severe; high water table | Severe; high water table. | Severe; high water table | Severe; high water table | Severe; high water table. |
| Severe; high water table | Severe; high water table. | Severe; high water table | Severe; high water table | Severe; high water table. |
| Severe; flooding | Moderate; flooding | Moderate; flooding | Severe; flooding | Severe; flooding. |
| Severe; flooding | Moderate; flooding | Moderate; flooding | Severe; flooding | Severe; flooding. |
| Severe; high water table | Severe; high water table. | Severe; high water table | Severe; high water table | Severe; high water table. |
| Severe; slope | Severe; slope | Severe; slope | Severe; slope | Severe; slope. |
| Severe; stoniness, slope | Severe; stoniness, slope. | Severe; stoniness, slope | Severe; stoniness, slope | Severe; stoniness, slope. |
| Severe; slope | Severe; coarse fragments, slope. | Severe; variable material, slope. | Severe; instability, slope | Severe; instability, slope. |
| Moderate; seasonal high water table. | Severe; slow permeability, seasonal high water table. | Slight | Severe; slow permeability, seasonal high water table. | Severe; slow permeability, seasonal high water table. |
| Moderate; seasonal high water table. | Severe; slow permeability, seasonal high water table. | Slight | Severe; slow permeability, seasonal high water table. | Severe; slow permeability, seasonal high water table. |
| Severe; instability, slope | Severe; clayey subsoil | Severe; clayey subsoil | Severe; clayey subsoil, slow permeability. | Severe; instability, clayey subsoil. |
| Severe; slope | Severe; slope | Severe; clayey subsoil | Severe; clayey subsoil, slow permeability. | Severe; instability, clayey subsoil. |
| Severe; slope | Severe; slope | Severe; slope | Severe; slope, clayey subsoil. | Severe; slope, instability, clayey subsoil. |
| Moderate; seasonal high water table, slope. | Severe; slow permeability, seasonal high water table. | Slight | Severe; slow permeability, seasonal high water table. | Severe; slow permeability, seasonal high water table. |
| Severe; slope | Severe; slope | Moderate; slope | Severe; slow permeability, seasonal high water table. | Severe; slow permeability, seasonal high water table. |
| Severe; slope, shallow to rock. | Severe; slope, shallow to rock, shaly surface. | Moderate; shallow to rock. | Severe; shallow to rock | Moderate; shallow to rock. |
| Severe; slope, shallow to rock. | Severe; slope, shallow to rock, shaly surface. | Moderate; shallow to rock. | Severe; shallow to rock | Moderate; shallow to rock. |
| Severe; slope, shallow to rock. | Severe; slope, shallow to rock, shaly surface. | Severe; slope | Severe; slope | Severe; slope. |
| Severe; slope | Severe; slope | Severe; slope | Severe; slope | Severe; slope. |

TABLE 7.—*Degree of soil limitation for selected nonfarm*

| Soil series and map symbols | Community development group | Degree and cause of limitation for— | | | |
|---|---|---|---|---|---|
| | | Disposal of effluent from septic tanks | Sewage lagoons | Residence location | Landscaping and lawns |
| Westmoreland: | | | | | |
| WmB2 | 3 | Severe; shallow to rock. | Severe; slope, shallow to rock. | Moderate; shallow to rock. | Moderate; slope |
| WmC2 | 4 | Severe; slope | Severe; slope | Moderate; shallow to rock. | Moderate; slope |
| WmD3 | 11 | Severe; slope | Severe; slope | Severe; slope | Severe; slope |
| Wharton: | | | | | |
| WrA | 12 | Severe; slow permeability. | Slight | Severe; instability, seasonal high water table. | Slight |
| WrB2 | 12 | Severe; slow permeability. | Moderate; slope | Severe; instability, seasonal high water table. | Slight |
| WrC2 | 13 | Severe; slow permeability. | Severe; slope | Severe; instability, seasonal high water table. | Moderate; seasonal high water table, slope. |
| WrC3 | 13 | Severe; slow permeability. | Severe; slope | Severe; instability, seasonal high water table. | Severe; eroded, seasonal high water table, slope. |
| WrD2 | 13 | Severe; slope | Severe; slope | Severe; instability, slope. | Severe; slope |

### *Community development group 4*

In this group are moderately steep, deep and moderately deep, well-drained Clymer, Dekalb, Gilpin, and Westmoreland soils. These soils are too steep for extensive commercial, industrial, or institutional development, but slopes of up to 25 percent are satisfactory for residential development.

Surface drainage is good, and permeability is moderate to rapid. The water table is not seasonally high. The depth to sandstone, hard shale, or limestone ranges from 1 foot to about 4 feet.

These soils are fairly good for building foundations. They are severely limited for use as septic tank filter fields because of their moderate depth, the variable underlying rock, and the moderately steep slopes. The Clymer soil is deeper than the other soils, but it is very stony, and the many stones would make excavation difficult and expensive.

### *Community development group 5*

Level to sloping, well-drained, very stony Dekalb and Gilpin soils make up this group. These soils are difficult and expensive to grade and excavate because they are so stony.

Surface drainage is good, and permeability is moderate to rapid. The water table is not seasonally high.

The soils are generally good for building foundations, and slopes are no deterrent to construction. Because they are shallow to moderately deep and, moreover, are underlain by sandstone and hard shale, these soils are severely limited for use as disposal fields for septic tanks. Furthermore, septic tanks in these soils could result in the contamination of shallow wells, especially in the sandstone areas of the Dekalb soil.

### *Community development group 6*

Moderately steep, moderately deep, very stony, well-drained, permeable Dekalb, Gilpin, and Ramsey soils make up this group. These soils are difficult and expensive to grade and excavate because they are so stony. They are too steep for high-density commercial, industrial, or institutional development, but slopes of up to 25 percent are satisfactory for medium-density residential development.

Surface drainage is good, and permeability is moderate to rapid. The water table is not seasonally high.

These soils are generally good for building foundations, but they are severely limited for use as disposal fields for septic tanks because they are shallow and are underlain by hard rock. Furthermore, septic tanks in these soils could result in contamination of ground water, especially where the underlying rock is permeable.

### *Community development group 7*

This group consists of gently sloping or sloping, deep or moderately deep, well-drained Gilpin and Upshur soils. These soils are highly erodible. They are unstable and, therefore, are severely limited for building foundations. They are saturated at times in spring and late in fall because of their slowly permeable subsoil and substratum. This seasonal saturation causes drainage problems that make it necessary to seal basements. The suitability of these soils as building sites, therefore, is questionable.

These soils are severely limited for use as disposal fields for septic tanks. Because they have a high shrink-swell potential and are susceptible to frost heaving, they are poor soils for roads and most other nonfarm uses.

*uses, and chief limiting properties*—Continued

| Degree and cause of limitation for—Continued | | | | |
|---|---|---|---|---|
| Streets and parking lots | Athletic fields | Parks and play areas | Sanitary land fill | Cemeteries |
| Severe; slope, shallow to rock. | Severe; slope, shallow to rock. | Moderate; slope | Severe; shallow to rock | Severe; shallow to rock. |
| Severe; slope | Severe; slope | Moderate; slope | Severe; slope, shallow to rock. | Severe; shallow to rock. |
| Severe; slope | Severe; slope | Severe; slope | Severe; slope | Severe; slope. |
| Moderate; seasonal high water table. | Moderate; seasonal high water table. | Slight | Severe; instability, seasonal high water table. | Severe; instability, seasonal high water table. |
| Moderate; seasonal high water table. | Moderate; seasonal high water table. | Slight | Severe; instability, seasonal high water table. | Severe; instability, seasonal high water table. |
| Severe; slope | Severe; slope | Moderate; slope | Severe; instability, slope, seasonal high water table. | Severe; instability, slope, seasonal high water table. |
| Severe; slope | Severe; slope | Moderate; slope | Severe; instability, slope, seasonal high water table. | Severe; eroded, slope, instability. |
| Severe; slope | Severe; slope | Severe; slope | Severe; slope | Severe; slope. |

***Community development group 8***

This group consists of sloping and moderately steep, deep or moderately deep, well-drained Gilpin and Upshur soils. These soils are poorly suited to most residential development. They have a wet, sticky surface layer that is harsh and cloddy when dry. They tend to slip when saturated, are susceptible to frost action, and are highly erodible. The Upshur soil is slowly permeable.

These soils are well suited to grass. Thus, in potential residential development areas, they can be used for lawns and parks.

***Community development group 9***

In this group are level to sloping, shallow and very shallow, well-drained Gilpin and Weikert soils.

These soils are generally good for building foundations, and slopes are no deterrent to construction. Hard shale, however, is at a depth of 2 feet or less; and after earthmoving, so much raw shale is on the surface or close to the surface that grass, shrubs, and trees are difficult to establish.

Because they are shallow and are underlain by hard shale, these soils are generally severely limited for use as filter fields for septic tanks. Percolation tests are required to determine the filtration capacity. Septic tanks in these soils could result in the contamination of ground water.

***Community development group 10***

The Gilpin and Weikert soils in this group are moderately steep, shallow or very shallow, and well drained.

Slopes impose some limitations for residential development. Generally, hard shale suitable for building foundations is at a depth of 2 feet or less. For most construction, some of the shale has to be removed. Grading and earthmoving leave so much raw shale on the surface that expensive amendments are needed to establish grass, shrubs, or trees. Controlling runoff and erosion is often a problem during and after development. Some soil creep is evident on the steeper slopes.

These soils are generally severely limited for use as a filtration medium for septic tanks because they are shallow and are underlain by hard shale. Also, the waste may seep to the surface downslope.

***Community development group 11***

In this group are steep or very steep, very shallow to moderately deep, well-drained Dekalb, Ramsey, Gilpin, Weikert, Upshur, and Westmoreland soils.

These soils are too steep for medium- or high-density residential development. Many houses have been built on the lesser slopes, but construction and maintenance of roads and sewerlines have been expensive, soil creep has occurred, and controlling runoff and erosion has been a problem. Also, lawns have been difficult and expensive to establish and maintain.

Parks, forests, and game preserves are the best uses for these soils. Some areas are desirable homesites because they have unobstructed views, but only luxury housing on large tracts is feasible in these areas, and special investigation and special design are needed at each site.

***Community development group 12***

In this group are level to gently sloping, deep or moderately deep, moderately well drained Clarksburg, Cookport, Ernest, Guernsey, Monongahela, Vandergrift, and Wharton soils. Cookport and Ernest soils are very stony in places, and they are difficult and expensive to grade

and excavate. Within areas of Ernest and Wharton soils are some deep, well-drained soils that are well suited to nonfarm development.

Slopes impose no limitations for nonfarm development, but the water table, which rises seasonally and in most years stays high for several weeks, causes drainage problems. Generally, basements have to be sealed. The high water table also interferes with the disposal of effluent from septic tanks. These soils are highly susceptible to frost heaving.

#### *Community development group 13*

In this group are sloping and moderately steep, deep or moderately deep, moderately well drained Clarksburg, Cookport, Ernest, Guernsey, Monongahela, Vandergrift, and Wharton soils. Cookport and Ernest soils are very stony in places and are difficult and expensive to grade and excavate.

The soils in this group are moderately well suited to residential development. They are moderately or highly susceptible to frost heaving and are subject to soil creep. Their water table is seasonally high, and seeps are likely to occur on hillsides. When the water table rises, drainage and sealing of basements are problems. Slow permeability limits the capacity of these soils for disposing of effluent from septic tanks. In places the waste may seep to the surface downslope.

#### *Community development group 14*

In this group are level to moderately steep, deep and moderately deep, poorly drained and somewhat poorly drained Armagh, Brinkerton, Cavode, Nolo, Purdy, and Tygart soils. Some of the Brinkerton soils are very wet and have a high water table that recedes only in a dry year. The Armagh, Nolo, and Purdy soils have a high water table for several months of the year. In the Cavode and Tygart soils, the water table does not rise so high nor does it stay high for so long a period.

For any kind of structure on these soils, fill is needed to raise the foundation above the water table. The fill should be adequately drained to guard against the water table rising to a new level. These soils generally are not favorable sites for heavy structures, nor are they a favorable medium for the disposal of effluent from septic tanks.

#### *Community development group 15*

The soils in this group, the Atkins, the Philo, and the Pope, are level and nearly level and occur on flood plains. Many areas of the Atkins soil are flooded 2 or 3 times a year. The other soils are flooded once a year to once in several years.

These soils, under natural conditions, are severely limited for use as building sites, but they can be used for parks and other recreational areas.

#### *Community development group 16*

This group consists of Made land, Mine dumps, Stony land, and Strip mine spoil, all of which are miscellaneous land types. Most of the acreage of Made land is already in nonfarm uses. The other land types are so variable in characteristics that on-site inspection is necessary.

Mine dumps possibly can be used as fill for poorly drained soils or, after leveling, for commercial, industrial, or institutional development, provided that on-site investigations are favorable. Most of the material likely is too porous for filtration purposes.

Stony land is not suitable for houses or other small buildings. Excavation and grading costs would be too high.

Strip mine spoil, after leveling, possibly can be used for residential or commercial development. The underlying rock has been shattered and is now part of the soil material. Soil depth thus has been increased, and more filtration material is available for disposal of waste from septic tanks. Establishing lawns in these areas would be difficult and expensive; and the application of water would tend to increase the outflow of contaminants into streams.

## *Descriptions of the Soils*

This section provides information about the soils in Indiana County. The procedure is first to describe the soil series, and then the individual soils, or mapping units, in that series. To get full information on any one soil, it is necessary to read the description of that soil and also the description of the soil series to which it belongs.

A profile is described for each soil series, and this profile is considered representative of all the soils in that series. If the profile of a given soil differs somewhat from the representative profile, the differences are pointed out in the description of that soil, unless they are apparent from the name of the soil.

In parentheses following the name of each soil is a symbol that identifies the soil on the detailed soil map that is at the back of this report. The description of each soil ends with a reference to the capability unit, the woodland group, and the community development group in which it has been placed. The capability units, woodland groups, and community development groups are discussed in other sections of this report.

Table 8 gives the approximate acreage and proportional extent of the individual soils. The soil map in the back of this report shows the location and distribution of the soils, and the Glossary defines many of the technical terms used in this section.

### Allegheny Series

This series consists of deep, well-drained, medium-textured soils that formed in old, acid alluvium. These soils occur mostly near Blairsville, on the level to sloping terraces along the Conemaugh River, and near Black Lick and Shelocta, on the terraces along Blacklick Creek and Crooked Creek.

The native vegetation consists of second- and third-growth hardwoods, including scarlet, red, white, and black oaks; tulip-poplar, black cherry, and elm. Some sassafras, dogwood, and basswood trees are also present.

The plow layer of a typical Allegheny soil is a very mellow dark-brown silt loam. The upper part of the subsoil is a strong-brown, friable silt loam that generally contains some gravel, and the lower part is a dark-brown gravelly sandy clay loam.

TABLE 8.—*Approximate acreage and proportional extent of the soils*

| Symbol | Soil | Area | Extent |
|---|---|---|---|
| | | *Acres* | *Percent* |
| AhA | Allegheny silt loam, 0 to 3 percent slopes | 1, 882 | 0. 4 |
| AhB2 | Allegheny silt loam, 3 to 8 percent slopes, moderately eroded | 1, 662 | . 3 |
| AhC2 | Allegheny silt loam, 8 to 15 percent slopes, moderately eroded | 470 | . 1 |
| ArA | Armagh silt loam, 0 to 3 percent slopes | 235 | (1) |
| ArB2 | Armagh silt loam, 3 to 8 percent slopes, moderately eroded | 331 | . 1 |
| At | Atkins silt loam | 12, 893 | 2. 4 |
| BkA | Brinkerton silt loam, 0 to 3 percent slopes | 2, 233 | . 4 |
| BkB2 | Brinkerton silt loam, 3 to 8 percent slopes, moderately eroded | 4, 994 | . 9 |
| BnA | Brinkerton silt loam, very wet, 0 to 3 percent slopes | 957 | . 2 |
| BnB | Brinkerton silt loam, very wet, 3 to 8 percent slopes | 177 | (1) |
| BsB | Brinkerton very stony silt loam, 0 to 8 percent slopes | 37 | (1) |
| BtB | Brinkerton very stony silt loam, very wet, 0 to 8 percent slopes | 250 | (1) |
| CaA | Cavode silt loam, 0 to 3 percent slopes | 1, 653 | . 3 |
| CaB2 | Cavode silt loam, 3 to 8 percent slopes, moderately eroded | 8, 732 | 1. 6 |
| CaC2 | Cavode silt loam, 8 to 15 percent slopes, moderately eroded | 4, 518 | . 9 |
| CaD2 | Cavode silt loam, 15 to 25 percent slopes, moderately eroded | 617 | . 1 |
| CcC3 | Cavode silty clay loam, 8 to 15 percent slopes, severely eroded | 1, 599 | . 3 |
| CdB | Cavode very stony silt loam, 0 to 8 percent slopes | 515 | . 1 |
| CdC | Cavode very stony silt loam, 8 to 25 percent slopes | 181 | (1) |
| CkB2 | Clarksburg silt loam, 3 to 8 percent slopes, moderately eroded | 251 | (1) |
| CkC2 | Clarksburg silt loam, 8 to 15 percent slopes, moderately eroded | 506 | . 1 |
| ClA2 | Clymer channery loam, 0 to 5 percent slopes, moderately eroded | 5, 614 | 1. 1 |
| ClB2 | Clymer channery loam, 5 to 12 percent slopes, moderately eroded | 10, 127 | 1. 9 |
| ClC2 | Clymer channery loam, 12 to 20 percent slopes, moderately eroded | 3, 049 | . 6 |
| CmB | Clymer very stony loam, 0 to 12 percent slopes | 6, 319 | 1. 2 |
| CmD | Clymer very stony loam, 12 to 35 percent slopes | 2, 469 | . 5 |
| CoA | Cookport loam, 0 to 3 percent slopes | 2, 858 | . 5 |
| CoB2 | Cookport loam, 3 to 8 percent slopes, moderately eroded | 9, 546 | 1. 8 |
| CoC2 | Cookport loam, 8 to 15 percent slopes, moderately eroded | 2, 209 | . 4 |
| CpB | Cookport very stony loam, 0 to 8 percent slopes | 712 | . 1 |
| CpC | Cookport very stony loam, 8 to 25 percent slopes | 664 | . 1 |
| DaA2 | Dekalb channery sandy loam, 0 to 5 percent slopes, moderately eroded | 2, 859 | . 5 |
| DaB2 | Dekalb channery sandy loam, 5 to 12 percent slopes, moderately eroded | 10, 277 | 1. 9 |
| DaC2 | Dekalb channery sandy loam, 12 to 20 percent slopes, moderately eroded | 10, 546 | 2. 0 |
| DbB | Dekalb very stony sandy loam, 0 to 12 percent slopes | 366 | . 1 |
| DgB | Dekalb-Gilpin very stony loams, 0 to 12 percent slopes | 2, 957 | 0. 1 |
| DgD | Dekalb-Gilpin very stony loams, 12 to 35 percent slopes | 14, 331 | 2. 7 |
| DgF | Dekalb-Gilpin very stony loams, 35 to 100 percent slopes | 6, 256 | 1. 2 |
| DkD2 | Dekalb and Ramsey channery sandy loams, 20 to 35 percent slopes, moderately eroded | 7, 331 | 1. 4 |
| DrD | Dekalb and Ramsey very stony sandy loams, 12 to 35 percent slopes | 556 | . 1 |
| ErA2 | Ernest silt loam, 0 to 3 percent slopes, moderately eroded | 1, 264 | . 2 |
| ErB2 | Ernest silt loam, 3 to 8 percent slopes, moderately eroded | 36, 642 | 6. 9 |
| ErB3 | Ernest silt loam, 3 to 8 percent slopes, severely eroded | 717 | . 1 |
| ErC2 | Ernest silt loam, 8 to 15 percent slopes, moderately eroded | 25, 916 | 4. 9 |
| ErC3 | Ernest silt loam, 8 to 15 percent slopes, severely eroded | 2, 435 | . 5 |
| ErD2 | Ernest silt loam, 15 to 25 percent slopes, moderately eroded | 782 | . 1 |
| EsB | Ernest very stony silt loam, 0 to 8 percent slopes | 4, 688 | . 9 |
| EsC | Ernest very stony silt loam, 8 to 25 percent slopes | 3, 395 | . 6 |
| GcA2 | Gilpin channery silt loam, 0 to 5 percent slopes, moderately eroded | 5, 907 | 1. 1 |
| GcB2 | Gilpin channery silt loam, 5 to 12 percent slopes, moderately eroded | 27, 629 | 5. 2 |
| GcC2 | Gilpin channery silt loam, 12 to 20 percent slopes, moderately eroded | 41, 783 | 7. 9 |
| GcD2 | Gilpin channery silt loam, 20 to 35 percent slopes, moderately eroded | 17, 707 | 3. 3 |
| GnB | Gilpin very stony silt loam, 0 to 12 percent slopes | 1, 437 | . 3 |
| GnD | Gilpin very stony silt loam, 12 to 35 percent slopes | 5, 842 | 1. 1 |
| GpE2 | Gilpin and Weikert channery silt loams, 35 to 70 percent slopes, moderately eroded | 10, 279 | 1. 9 |
| GrF | Gilpin and Weikert very stony silt loams, 35 to 100 percent slopes | 1, 915 | . 4 |
| GwA2 | Gilpin-Weikert shaly silt loams, 0 to 5 percent slopes, moderately eroded | 4, 483 | . 8 |
| GwB2 | Gilpin-Weikert shaly silt loams, 5 to 12 percent slopes, moderately eroded | 15, 712 | 3. 0 |
| GwC2 | Gilpin-Weikert shaly silt loams, 12 to 20 percent slopes, moderately eroded | 24, 666 | 4. 6 |
| GyB2 | Guernsey silt loam, 3 to 8 percent slopes, moderately eroded | 442 | . 1 |
| GyC3 | Guernsey silt loam, 8 to 15 percent slopes, severely eroded | 559 | . 1 |
| Ma | Made land | 112 | (1) |
| Md | Mine dumps | 2, 137 | . 4 |
| MoA2 | Monongahela silt loam, 0 to 3 percent slopes, moderately eroded | 3, 516 | . 7 |
| MoB2 | Monongahela silt loam, 3 to 8 percent slopes, moderately eroded | 3, 708 | . 7 |
| MoC2 | Monongahela silt loam, 8 to 15 percent slopes, moderately eroded | 657 | . 1 |
| NoA | Nolo silt loam, 0 to 3 percent slopes | 402 | . 1 |
| NoB | Nolo silt loam, 3 to 8 percent slopes | 459 | . 1 |
| Ph | Philo silt loam | 9, 189 | 1. 7 |
| Pm | Pope fine sandy loam | 2, 164 | . 4 |

See footnote at end of table.

TABLE 8.—*Approximate acreage and proportional extent of the soils*—Continued

| Symbol | Soil | Area | Extent | Symbol | Soil | Area | Extent |
|---|---|---|---|---|---|---|---|
| | | *Acres* | *Percent* | | | *Acres* | *Percent* |
| Po | Pope silt loam | 1, 738 | 0. 3 | WgB3 | Weikert-Gilpin shaly silt loams, 5 to 12 percent slopes, severely eroded | 2, 929 | 0. 6 |
| PuA | Purdy silt loam, 0 to 5 percent slopes | 809 | . 2 | WgC3 | Weikert-Gilpin shaly silt loams, 12 to 20 percent slopes, severely eroded | 13, 481 | 2. 5 |
| RcE | Ramsey and Dekalb channery sandy loams, 35 to 70 percent slopes | 3, 815 | . 7 | WkD2 | Weikert and Gilpin shaly silt loams, 20 to 35 percent slopes, moderately eroded | 9, 415 | 1. 8 |
| RdF | Ramsey and Dekalb very stony sandy loams, 35 to 100 percent slopes | 190 | (1) | WkD3 | Weikert and Gilpin shaly silt loams, 20 to 35 percent slopes, severely eroded | 20, 340 | 3. 8 |
| So | Stony land, sloping | 128 | (1) | WkF2 | Weikert and Gilpin shaly silt loams, 35 to 100 percent slopes, moderately eroded | 8, 779 | 1. 7 |
| Sp | Stony land, steep | 808 | . 2 | WkF3 | Weikert and Gilpin shaly silt loams, 35 to 100 percent slopes, severely eroded | 12, 225 | 2. 3 |
| Sr | Strip mine spoil, sloping | 3, 993 | . 8 | WmB2 | Westmoreland silt loam, 5 to 12 percent slopes, moderately eroded | 764 | . 1 |
| St | Strip mine spoil, steep | 8, 901 | 1. 7 | WmC2 | Westmoreland silt loam, 12 to 20 percent slopes, moderately eroded | 928 | . 2 |
| TrA | Tygart silt loam, 0 to 3 percent slopes | 1, 289 | . 2 | WmD3 | Westmoreland silt loam, 20 to 35 percent slopes, severely eroded | 485 | . 1 |
| TrB2 | Tygart silt loam, 3 to 8 percent slopes, moderately eroded | 698 | . 1 | WrA | Wharton silt loam, 0 to 3 percent slopes | 5, 872 | 1. 1 |
| UgB2 | Upshur-Gilpin silty clay loams, 3 to 8 percent slopes, moderately eroded | 2, 583 | . 5 | WrB2 | Wharton silt loam, 3 to 8 percent slopes, moderately eroded | 15, 334 | 2. 9 |
| UgC2 | Upshur-Gilpin silty clay loams, 8 to 15 percent slopes, moderately eroded | 2, 449 | . 5 | WrC2 | Wharton silt loam, 8 to 15 percent slopes, moderately eroded | 6, 569 | 1. 2 |
| UgC3 | Upshur-Gilpin silty clay loams, 8 to 15 percent slopes, severely eroded | 901 | . 2 | WrC3 | Wharton silt loam, 8 to 15 percent slopes, severely eroded | 823 | . 2 |
| UgD2 | Upshur-Gilpin silty clay loams, 15 to 25 percent slopes, moderately eroded | 1, 074 | . 2 | WrD2 | Wharton silt loam, 15 to 25 percent slopes, moderately eroded | 480 | . 1 |
| UgD3 | Upshur-Gilpin silty clay loams, 15 to 25 percent slopes, severely eroded | 1, 718 | . 3 | | Mines and Pits | 9 | (1) |
| UgE3 | Upshur-Gilpin silty clay loams, 25 to 45 percent slopes, severely eroded | 1, 437 | . 3 | | | | |
| VaB2 | Vandergrift silt loam, 3 to 8 percent slopes, moderately eroded | 440 | . 1 | | | | |
| VaC2 | Vandergrift silt loam, 8 to 15 percent slopes, moderately eroded | 153 | (1) | | Total | 531, 840 | 99. 5 |

[1] Less than 0.05 percent. These small areas account for the 0.5 percent.

Profile of Allegheny silt loam, 0 to 3 percent slopes, in a hayfield 1½ miles west of Blairsville:

Ap—0 to 8 inches, dark-brown (7.5YR 3/2) silt loam; weak. fine, granular structure; very friable when moist; strongly acid (pH 5.3); abrupt, wavy boundary; 7 to 10 inches thick.

B1—8 to 10 inches, dark-brown (7.5YR 4/2) silt loam; weak, fine, platy structure; friable when moist, slightly sticky and slightly plastic when wet; patchy clay films; strongly acid (pH 5.2); clear, wavy boundary; 2 to 6 inches thick.

B21t—10 to 27 inches, strong-brown (7.5YR 5/6) gravelly silt loam; weak, medium, subangular blocky structure; friable when moist, slightly sticky and slightly plastic when wet; thick patchy clay films on peds and in pores; strongly acid (pH 5.4); gradual boundary; 14 to 26 inches thick. (Coarse fragments up to 5 inches in diameter make up about 30 percent of this horizon.)

B22t—27 to 47 inches, dark-brown (7.5YR 4/4) gravely sandy clay loam; moderate, medium, subangular blocky structure; firm when moist, slightly sticky and slightly plastic when wet; thin discontinuous clay films on peds and in pores; common red and black concretions; very strongly acid (pH 5.0); gradual, wavy boundary; 12 to 24 inches thick. (Coarse fragments up to 6 inches in diameter make up 40 percent of this horizon.

C—47 inches +, stratified silt, sand, and gravel.

The B horizon ranges from dark brown (7.5YR 4/4) to yellowish brown (10YR 5/6) in color and from silty clay loam to gravelly sandy loam in texture. The depth to the stratified silt, sand, and gravel ranges from 3 to 5 feet, and the depth to hard shale or sandstone ranges from 4 to 20 feet.

Allegheny soils are commonly adjacent to the moderately well drained or somewhat poorly drained Monongahela soils, with which they form a drainage sequence. They lie near Tygart and Purdy soils, both of which are more poorly drained than Allegheny soils, and more clayey in the subsoil. Allegheny soils commonly border the Gilpin, Dekalb, Weikert, and Ramsey soils of the uplands, all of which are shallower to bedrock and contain coarse, angular fragments instead of the gravel that is common in Allegheny soils.

Allegheny soils are easy to till. They are thoroughly leached and are low in natural fertility. They are strongly acid in the upper part and very strongly acid in the lower part. The water-holding capacity is moderately high. Aeration and internal drainage are good.

**Allegheny silt loam, 0 to 3 percent slopes** (AhA).—This soil is deep, well drained, and moderately permeable. Its

profile is the one described as typical of the Allegheny series. Included in the mapped areas of this soil are small spots of mottled loamy soils that have a fragipan at a depth of 3 feet or more.

If adequately limed and fertilized, this soil is well suited to all the crops commonly grown in the county. Growing hay for at least 1 year and row crops for not more than 2 years in a 4-year period, and growing a cover crop after the row crops, helps to preserve good tilth and to maintain the supply of organic matter. Farming on the contour increases the amount of water taken in by the soil.

This soil is suited to timber production, and it can be developed as a habitat for pheasant, rabbit, and other open-land wildlife. It is highly suitable for use as a sewage-disposal field and for residential, light industrial, commercial, and institutional development. (Capability unit I–1; woodland group 4; community development group 1)

**Allegheny silt loam, 3 to 8 percent slopes, moderately eroded** (AhB2).—This is a deep, well-drained, moderately permeable soil on terraces along the larger streams. It is not subject to flooding. Much of the original surface layer has washed away. In plowed areas the upper part of the subsoil has been mixed with the remaining part of the original surface layer. Consequently, the present surface layer in the plowed areas is lighter colored and more gravelly than the surface layer in some of the non-eroded wooded areas.

This soil is well suited to farming. Because of the slope and the erosion hazard, it is advisable to farm on the contour and to grow at least 2 years of hay and not more than 2 years of row crops in a 5-year period. Diversions may be needed on long slopes.

This soil is well suited to timber production, and it can be developed as a habitat for pheasant, rabbit, and other open-land wildlife. It is highly suitable for use as a sewage-disposal field in low-density and medium-density housing areas, and for residential, commercial, light industrial, and institutional developments. (Capability unit IIe–1; woodland group 4; community development group 1)

**Allegheny silt loam, 8 to 15 percent slopes, moderately eroded** (AhC2).—This soil is shallower than the typical Allegheny soil. Stratified materials are at a depth of 36 to 42 inches. Some small areas are slightly eroded, and others are severely eroded.

A 4-year rotation that includes at least 2 years of hay and not more than 1 year of row crops is needed to help reduce erosion in cultivated areas. Contour strips are needed on short slopes, and diversions are needed on long slopes.

This soil is well suited to timber production, and it can be developed as a habitat for open-land wildlife. Slope is the main limitation for such uses as roads, parking lots, and athletic fields, and it is a moderate limitation for residential, light industrial, commercial, and institutional development. Moderate permeability and slope moderately limit the use of this soil as a sewage-disposal field. (Capability unit IIIe–1; woodland group 4; community development group 2)

## Armagh Series

This series consists of level to gently sloping, medium-textured, poorly drained soils that formed in soft, acid, gray clay shale, which is sometimes called fire clay. These soils are on benches throughout the county. They occur mostly as small areas surrounded by the somewhat poorly drained Cavode soils, but they occupy some larger areas north of Pine Flats and south of Bowdertown. Seep spots are common.

The native vegetation consists chiefly of red oak, white oak, and red maple; beech, hickory, and elm grow in some areas.

The plow layer of a typical Armagh soil is a very dark gray heavy silt loam. The subsoil is a light brownish-gray or light-gray silty clay that has reddish-yellow and brown mottles. It is sticky and plastic when wet. Water moves very slowly through it.

Profile of Armagh silt loam, 0 to 3 percent slopes, in an idle field a fourth of a mile north of Pine Flats:

Ap—0 to 7 inches, very dark gray (10YR 3/1) silt loam; few, fine, distinct, strong-brown (7.5YR 5/6) mottles; weak, fine, granular structure; friable when moist, slightly sticky and slightly plastic when wet; very strongly acid (pH 5.0); clear, smooth boundary; 6 to 9 inches thick.

B1g—7 to 10 inches, light brownish-gray (2.5Y 6/2) light silty clay loam; many, medium, distinct, reddish-yellow (7.5YR 6/6) mottles; moderate, medium, subangular blocky structure; friable when moist, sticky and plastic when wet; thin, discontinuous clay films; very strongly acid (pH 4.5); clear, wavy boundary; 2 to 5 inches thick.

B21tg—10 to 17 inches, silty clay loam; light brownish gray (2.5Y 6/2) on ped faces and when crushed; many, fine and medium, distinct, strong-brown (7.5YR 5/6) mottles; moderate, medium, prismatic structure breaking to moderate, medium, subangular blocky; firm when moist, sticky and plastic when wet; thick, continuous films of silt and clay; very strongly acid (pH 4.7); gradual, wavy boundary; 4 to 10 inches thick.

B22tg—17 to 28 inches, light-gray (2.5Y 7/2) silty clay; many, fine and medium, distinct, strong-brown (7.5YR 5/6) mottles; moderate, medium, subangular blocky structure breaking to moderate, fine, blocky; firm when moist, sticky and plastic when wet; thick, continuous films of silt and clay on peds; common black concretions; very strongly acid (pH 5.0); gradual, irregular boundary; 7 to 15 inches thick.

Cg—28 to 45 inches +, gray (N 5/0) silty clay loam; many, fine and medium, prominent, dark grayish-brown (10YR 4/2) and dark yellowish-brown (10YR 4/4) mottles; massive; very firm when moist, sticky and plastic when wet; many black concretions.

The B horizon ranges from light brownish gray (2.5Y 6/2) to dark brown (10YR 4/3) in color and from silty clay loam to silty clay in texture. It is distinctly or prominently mottled throughout. The depth to the weathered, acid, gray clay shale ranges from 2 to 4 feet, and the depth to hard shale, siltstone, or sandstone ranges from 3 to 5 feet.

Armagh soils are commonly associated with Cavode and Wharton soils. They are grayer and more strongly mottled in the upper part of the subsoil than Cavode and Wharton soils.

Armagh soils are very strongly acid. They are slowly permeable below the plow layer, and they have a moderate water-holding capacity.

**Armagh silt loam, 0 to 3 percent slopes** (ArA).—The profile of this soil is that described as typical of the Armagh series. The somewhat poorly drained Cavode soils are included in some of the mapped areas of this soil.

This soil is best suited to perennial hay and to pasture grasses and legumes that tolerate wetness. Cultivated

crops can be grown 1 year in 5 years if hay is grown for 3 years. The surface layer is easily compacted if this soil is grazed or tilled when wet.

Most of this soil lies within areas of better drained soils that are farmed. Diversions or open and closed drains generally remove enough of the excess water so that this soil can be farmed with the better drained soils.

This soil is only moderately well suited to timber production but is well suited to use as a habitat for ducks, mink, and other wetland wildlife. For the most part, it is poorly suited to residential, commercial, light industrial, or institutional development because it has a high water table. (Capability unit IVw–1; woodland group 12; community development group 14)

**Armagh silt loam, 3 to 8 percent slopes, moderately eroded** (ArB2).—In some places this soil is only slightly eroded and has a dark-colored, mellow surface layer. In most places, however, it has lost much of the original surface layer through erosion, and the plow layer is a mixture of the remaining original surface layer and the lighter colored upper part of the subsoil. This soil is not so deep to shale and sandstone as the typical Armagh soil. Included in the mapped areas are severely eroded spots where the clayey subsoil is exposed; in these spots the soil is hard and cloddy when dry, and sticky when wet.

This soil is best suited to perennial hay and to pasture grasses and legumes that tolerate wetness. Cultivated crops can be grown 1 year in 6 years if hay is grown for 4 years or more. The long slopes need diversions, graded strips, and sodded waterways to reduce excess surface water.

This soil is moderately well suited to timber production and to use as a habitat for wetland wildlife. For the most part, it is poorly suited to residential, commercial, light industrial, or institutional development. (Capability unit IVw–2; woodland group 12; community development group 14)

## Atkins Series

This series consists of level and nearly level, medium-textured, poorly drained, prominently mottled soils that completely cover the narrow flood plains of many of the small streams in the county. Many of these areas are idle because they are waterlogged and frequently flooded. Atkins soils also occupy low spots and depressions on the flood plains of the larger streams, within areas of the better drained Pope and Philo soils. Here, the Atkins soils stay saturated much of the year because of a high water table and seepage.

Elm, willow, sycamore, hickory, hemlock, and yellow birch are the common trees on these soils; rhododendron, alder, spicebush, and ninebark are the common shrubs; and boneset, swamp grass, and skunkcabbage are the typical herbaceous plants.

The surface layer of a typical Atkins soil is a very dark grayish-brown, very mellow silt loam. Below a depth of 8 inches is a layer of dark grayish-brown, friable silt loam mottled with grayish brown and olive gray; and at a depth of 24 to 36 inches is gray or grayish-green silty clay loam.

Profile of Atkins silt loam (0 to 5 percent slopes) in an idle field 4 miles northeast of Clarksburg, along Hooper Run:

Ap—0 to 8 inches, very dark grayish-brown (2.5Y 3/2) silt loam; few, fine, faint, grayish-brown (2.5Y 5/2) mottles; weak, fine, granular structure; very friable when moist; medium acid (pH 5.7); abrupt, smooth boundary; 8 to 9 inches thick.

B1g—8 to 15 inches, very dark grayish-brown (2.5Y 3/2) heavy silt loam; many, fine, faint, grayish-brown (2.5Y 5/2) mottles; very weak, fine, subangular blocky structure; friable when moist, slightly sticky and slightly plastic when wet; strongly acid (pH 5.3); clear, wavy boundary; 6 to 9 inches thick.

B2g—15 to 25 inches, olive-gray (5Y 4/2) silty clay loam; many, medium, prominent, yellowish-red (5YR 4/6) mottles; massive; firm when moist, sticky and plastic when wet; strongly acid (pH 5.2); clear, wavy boundary; 9 to 12 inches thick.

C1g—25 to 37 inches, greenish-gray (5G 5/1) silty clay loam; many, coarse, prominent, yellowish-red (5YR 5/6) mottles; massive; firm when moist, sticky and plastic when wet; strongly acid (pH 5.4); gradual, wavy boundary; 11 to 15 inches thick.

IIC—37 inches +, stratified silt, sand, and fine gravel.

In some small areas the A horizon is silty clay loam, loam, sandy loam, or gravelly loam. The C horizon ranges from greenish gray (5G 5/1) to very dark grayish brown (2.5Y 3/2) in color and from loam to silty clay loam in texture. It is either structureless (massive) or has weak, fine, subangular blocky structure. Sandstone, siltstone, or hard shale is at a depth of 3 to 10 feet.

On broad flood plains, Atkins soils lie near Philo and Pope soils and near the colluvial Ernest and Brinkerton soils. They differ from Philo and Pope soils in that they are grayer and more poorly drained, and from Ernest and Brinkerton soils in that they do not have a well-developed subsoil.

Atkins soils are strongly acid and are moderately high in natural fertility. They have a moderately high water-holding capacity. Erosion is not a hazard; on the contrary, floods frequently leave depositions of soil material in many places.

**Atkins silt loam** (At).—The profile of this soil is the one described as typical of the Atkins series. Included in the mapped areas of this soil are poorly drained alluvial soils that contain some limy material, very poorly drained alluvial soils that have a deep organic surface layer, and poorly drained soils that are strongly acid because of mine water.

This soil is well suited to pasture. It can be used as cropland where a drainage system can be installed and floods are not frequent. It should not be grazed or tilled when wet.

This soil is fairly well suited to timber production. It can be developed as a habitat for woodland and wetland wildlife and can be used for parks and recreational areas, but floods and a high water table limit its use for residential, light industrial, commercial, or institutional development. (Capability unit VIw–1; woodland group 3; community development group 15)

## Brinkerton Series

The soils in this series are level to gently sloping, grayish, medium textured, and poorly drained. They formed in acid materials that slid or washed from the adjacent

uplands. Brinkerton soils are distributed throughout the county in valleys between the uplands and the flood plains. They cover large, concave or depressed areas at the head of small streams near Johnsonburg, Cookport, and Cherry Tree. These soils are waterlogged during the wetter periods of the year because of slow permeability in their subsoil.

Red oak, black oak, and American elm are the common trees, but beech, hickory, hemlock, yellow birch, shingle oak, and ironwood also grow on these soils. Alder, ninebark, spicebush, and thornapple are the common shrubs; and swamp grass, skunkcabbage, and goldenrod are the typical herbaceous plants.

The plow layer of a typical Brinkerton soil is a grayish-brown, mellow silt loam. The subsoil is a light brownish-gray to light-gray silty clay loam that has many yellow and strong-brown mottles. It is firm when moist and sticky and plastic when wet. Below the subsoil is a dense, grayish-brown to bluish-gray silty clay loam.

Profile of Brinkerton silt loam, 0 to 3 percent slopes, in a hayfield in White Township, 3½ miles northeast of Indiana (This is profile S61Pa32–50(1–7), for which physical and chemical data are given in tables 11 and 12, pages 94 and 98.) :

Ap—0 to 10 inches, grayish-brown (2.5Y 5/2) silt loam; few, fine, faint, light olive-brown (2.5Y 5/6) mottles; moderate, medium, granular structure; friable when moist, nonsticky and slightly plastic when wet; some black concretions; medium acid (pH 5.8); gradual, smooth boundary; 7 to 12 inches thick.

B2tg—10 to 17 inches, light brownish-gray (2.5Y 6/2) silty clay loam; many, medium, distinct, yellowish-brown (10YR 5/6) mottles; strong, medium, prismatic structure breaking to moderate, medium, blocky; firm when moist, sticky and plastic when wet; thick, continuous films of light brownish-gray (2.5Y 6/2) silt and clay; strongly acid (pH 5.0); clear, wavy boundary; 5 to 10 inches thick.

Bxg—17 to 26 inches, light-gray (2.5Y 7/2) silty clay loam; many, coarse, prominent, strong-brown (7.5YR 5/6) mottles; moderate, medium, prismatic structure breaking to weak, medium, platy; firm when moist, sticky and plastic when wet; thick, discontinuous films of silt and clay; strongly acid (pH 5.2); gradual, wavy boundary; 6 to 12 inches thick.

B31g—26 to 32 inches, light-gray (2.5Y 7/2) silty clay loam; many, fine, prominent, strong-brown (7.5YR 5/6) mottles; weak, fine and medium, subangular blocky structure; firm when moist, sticky and plastic when wet; occasional clay patches; strongly acid (pH 5.2); gradual, wavy boundary; 4 to 8 inches thick.

B32g—32 to 39 inches, light-gray (2.5Y 7/2) silty clay loam; many, medium, prominent, strong-brown (7.5YR 5/6) mottles; weak, medium, subangular blocky structure; firm when moist, sticky and plastic when wet; occasional clay patches; strongly acid (pH 5.2); gradual, irregular boundary; 4 to 9 inches thick.

C1g—39 to 54 inches, grayish-brown (10YR 5/2) silty clay loam; many, medium and coarse, distinct, brown (7.5YR 5/4) mottles; massive; slightly sticky and slightly plastic when wet; common, black (N 2/0) concretions and coatings; strongly acid (pH 5.3); gradual, irregular boundary; 11 to 20 inches thick.

C2g—54 to 60 inches +, bluish-gray (5B 5/1) silty clay loam; many, coarse, prominent, dark-brown (10YR 4/3) mottles; massive; somewhat platy in places; slightly sticky and slightly plastic when wet; some black concretions; medium acid (pH 5.8).

The A horizon ranges from loam to silty clay loam. In some places, small to large fragments of stone are on the surface and scattered throughout the profile. The B horizon ranges from grayish brown (2.5Y 5/2), the most common color, to bluish gray (5B 5/1). It is distinctly or prominently mottled throughout. The texture of this horizon ranges from heavy silt loam to silty clay, but silty clay loam is most common. The depth to the weathered colluvial material (generally silty clay loam) of the C horizon ranges from 30 to 54 inches. Ordinarily, this horizon is prominently mottled and has black and reddish-brown concretions. The depth to hard shale, siltstone, or sandstone ranges from 4 to 20 feet.

Brinkerton soils commonly occur above the Atkins, Philo, Monongahela, Purdy, and Tygart soils; are adjacent to or lie within areas of Ernest soils; and in many places are below the Cavode, Clymer, Cookport, Dekalb, Gilpin, Ramsey, Weikert, and Wharton soils. Brinkerton soils are grayer and are more distinctly mottled in the upper part of the subsoil than the Cavode, Cookport, Ernest, Philo, Monongahela, Tygart, and Wharton soils. They have a finer textured subsoil than the Atkins soils and a coarser textured subsoil than the Purdy soils.

Brinkerton soils are naturally acid and are moderately low in natural fertility. They have a moderately high water-holding capacity. Aeration is poor below the surface layer, and a high water table persists for several months of the year.

**Brinkerton silt loam, 0 to 3 percent slopes** (BkA).—This is the soil described as typical of the Brinkerton series. In the vicinity of Elders Ridge and West Lebanon, small areas of poorly drained Clarksburg soils are included in the mapped areas of this soil. In the eastern part of the county, where sandstone outcrops, some poorly drained colluvial soils are included. These colluvial soils have a very firm, dense, brittle fragipan.

This soil is best suited to perennial hay and pasture. Grasses and legumes that tolerate wetness thrive best and remain productive longer. A cultivated crop should be followed by 4 years or more of hay. Grain crops grow fairly well in an adequately drained field. Diversions are needed to intercept runoff from the adjacent uplands, and a tile drainage system and open ditches are needed to drain seep spots.

This soil is well suited to timber production, and it can be developed as a habitat for wetland wildlife. Wetness and slow permeability limit its suitability for residential, light industrial, commercial, or institutional development. (Capability unit IVw–1; woodland group 12; community development group 14)

**Brinkerton silt loam, 3 to 8 percent slopes, moderately eroded** (BkB2).—This soil has lost much of the original surface layer. Consequently, the plow layer consists mainly of clayey former subsoil. Surface drainage is better on this soil than on the soil described as typical of the series, but the erosion hazard is greater too.

This soil can be used for cultivated crops following 4 years or more of hay, but it is best suited to perennial hay or pasture grasses and legumes that tolerate wetness. Diversions and tile drains at the base of the adjacent uplands help to reduce surface and subsurface seepage and, thereby, to remove standing water.

This soil is well suited to timber production and moderately well suited to development as a habitat for wetland wildlife. Because of wetness and slow permeability, it is poorly suited to residential, commercial, industrial, or

institutional development. (Capability unit IVw–2; woodland group 12; community development group 14)

**Brinkerton silt loam, very wet, 0 to 3 percent slopes** (BnA).—This soil commonly lies within areas of better drained Brinkerton soils and is used mostly for pasture or woodland. Swamp grass, sedges, cattails, and other water-tolerant plants are common in open areas. Yellow birch, and hemlock that has hummocklike roots exposed, are the most common trees in wooded areas.

This soil has a high content of organic matter, and consequently much of the area was cleared and cultivated at one time. It has a high water table, however, and receives runoff from adjacent uplands, so it needs to be drained if cultivated. Most of the cultivated areas were not adequately drained, and subsequently they reverted to pasture or became idle.

In the open areas, the plow layer is a very dark gray, prominently mottled silt loam about 8 inches thick. To a depth of 27 inches, the subsoil is a dark-gray, prominently mottled silty clay that is stickier and more plastic when wet than the plow layer. Below this, to a depth of 51 inches, the subsoil is a gray silty clay that grades to a bluish gray silty clay loam. Yellowish-red and reddish-brown mottles and black concretions are conspicuous in this layer.

Included in the mapped areas of this soil are some very poorly drained soils on uplands. These soils either have a claypan in the lower part of their subsoil, like the poorly drained Armagh soils, or have a dense, firm fragipan, like the poorly drained Nolo soils.

Cultivated crops can be grown in a long rotation that includes 4 years or more of hay, but surface and subsurface drainage are necessary. Hay and pasture require less intensive drainage, and therefore these uses should not be overlooked.

This soil is only fairly well suited to timber production. It is well suited to development as a habitat for wetland wildlife but, because of a high water table and slow permeability, is poorly suited to residential, light industrial, commercial, or institutional development. (Capability unit IVw–1; woodland group 18; community development group 14)

**Brinkerton silt loam, very wet, 3 to 8 percent slopes** (BnB).—This soil is easier to drain than Brinkerton silt loam, very wet, 0 to 3 percent slopes, because it is on stronger slopes. In most places it is in smaller areas.

This soil is best suited to pasture or woodland but can be used for cultivated crops following 4 years or more of hay. Reed canarygrass grows well if this soil is sufficiently drained. Diversions and tile drains on the adjacent upland slopes help to reduce seepage from these areas.

This soil is fairly well suited to timber production and well suited to development as a habitat for wetland wildlife. Because of a high water table and slow permeability, it is poorly suited to residential, light industrial, commercial, or institutional development. (Capability unit IVw–2; woodland group 18; community development group 14)

**Brinkerton very stony silt loam, 0 to 8 percent slopes** (BsB).—This soil is like that described as the typical Brinkerton soil, except that it has many large stones on the surface and in the subsoil. Most of it is used for woodland.

This soil is fairly well suited to timber production and moderately well suited to development as a habitat for wetland wildlife. Because of wetness, slow permeability, and stoniness, it is poorly suited to residential, light industrial, commercial, or institutional development. (Capability unit VIIs–2; woodland group 12; community development group 14)

**Brinkerton very stony silt loam, very wet, 0 to 8 percent slopes** (BtB).—Except for an abundance of large stones in and on the soil and a greater range in slope, this soil is similar to Brinkerton silt loam, very wet, 0 to 3 percent slopes.

This soil is only fairly well suited to timber production. It is well suited to development as a habitat for wetland wildlife. The high water table, slow permeability, and stoniness limit its suitability for residential, light industrial, commercial, or institutional development. (Capability unit VIIs–2; woodland group 18; community development group 14)

## Cavode Series

This series consists of level to moderately steep, medium-textured, poorly drained soils that formed in acid, gray clay shale. These soils occur mainly on uplands. Fairly large areas are on nearly level, somewhat concave slopes west of Rossmoyne, east of Indiana, and north of Tunnelton. Smaller areas are scattered throughout the county.

The native vegetation consists of mixed hardwoods, including red oak, black oak, white oak, red maple, and beech. Tulip-poplar, hickory, ash, elm, dogwood, and black cherry grow in some areas; and hemlock, white pine, and yellow birch are common in the eastern part of the county.

The plow layer of a typical Cavode soil is a dark-brown, friable silt loam. The upper part of the subsoil is a brownish-yellow silty clay loam that generally has a few brownish-gray mottles. It is slightly sticky and plastic when wet. The lower part of the subsoil is a gray clay or silty clay mottled with reddish yellow and brown. This slowly permeable layer, a claypan, is sticky and plastic when wet.

Profile of Cavode silt loam, 0 to 3 percent slopes, in a wheatfield in Canoe Township, 2½ miles southeast of Rossiter (This is profile S61Pa32–59(1–6), for which physical and chemical data are given in tables 11 and 12, pages 94 and 98.):

Ap—0 to 11 inches, dark-brown (10YR 4/3) silt loam; weak, medium, granular structure; friable when moist; strongly acid (pH 5.0); abrupt, wavy boundary; 9 to 13 inches thick.

B1—11 to 16 inches, brownish-yellow (10YR 6/8) silty clay loam; common, medium, faint, light brownish-gray (10YR 6/2) mottles; weak, fine, subangular blocky structure; friable when moist, slightly sticky and slightly plastic when wet; thin, continuous clay films; very strongly acid (pH 4.8); gradual, wavy boundary; 3 to 7 inches thick.

B21t—16 to 21 inches, brownish-yellow (10YR 6/8) silty clay loam; common, medium, faint, pale-brown (10YR 6/3) mottles and few, fine, prominent, reddish-yellow (5YR 6/8) mottles; moderate, medium, subangular blocky structure; friable or firm when moist; slightly sticky and plastic when wet; thin, continuous clay films; very strongly acid (pH 4.8); clear, wavy boundary; 3 to 8 inches thick.

B22t—21 to 30 inches, pale-olive (5Y 6/3) silty clay loam; many, medium, prominent, reddish-yellow (5YR 6/8) mottles and light yellowish-brown (10YR 6/4) mottles; moderate to strong, medium, subangular blocky structure; friable or firm when moist, sticky and plastic when wet; thin, discontinuous clay films; extremely acid (pH 4.4); clear, wavy boundary; 4 to 10 inches thick.

B3g—30 to 47 inches, gray (5Y 6/1) silt loam; many, medium, prominent, yellowish-red (5YR 5/8) mottles; polygons approximately 3 inches in diameter break to moderate, medium, platy structure; friable when moist, slightly sticky and slightly plastic when wet; thin, discontinuous clay films; few, fine, black concretions; extremely acid (pH 4.4); clear, wavy boundary; 5 to 20 inches thick. (Coarse fragments make up 5 percent of this horizon.)

Cg—47 to 57 inches +, gray (5Y 6/1) silt loam; many, medium, prominent, yellowish-brown (10YR 5/4) and strong-brown (7.5YR 5/6) mottles; polygons 3 inches in diameter break to weak, medium, platy structure; firm when moist, slightly sticky and slightly plastic when wet; thin, discontinuous clay films and common, fine, black concretions; extremely acid (pH 4.1). (Coarse fragments make up 10 to 15 percent of this horizon.)

The B horizon ranges from silty clay loam to clay. It is strong brown (7.5YR 5/6) to gray (N 6/0) in color; generally the upper part has a 10YR hue and the lower part has a 2.5Y or 5Y hue. The lower part is distinctly or prominently mottled. The depth to the weathered, acid, gray clay shale ranges from 2 to 4 feet, and the depth to hard shale or sandstone ranges from 2½ to 6 feet. In some places there are stone fragments of all sizes on and in the soil.

Cavode soils and the moderately well drained, less gray Wharton soils share many level to gently sloping areas near most of the productive coal seams. Within areas of Cavode soils are poorly drained, grayer Armagh soils. On the steeper slopes, above and below the Cavode soils, are moderately deep, well-drained, nonmottled Gilpin soils and shallow, well-drained, nonmottled Weikert soils. Below the Cavode soils, on lower valley slopes, are the deeper, moderately well drained or somewhat poorly drained Ernest soils and the poorly drained Brinkerton soils. Cavode soils have a finer textured subsoil than Ernest soils. In the Cavode soils the upper part of the subsoil is not so gray or so mottled as that of Brinkerton soils, and the lower part is not so firm as that of Ernest soils.

On many of the broad ridgetops in the northern and eastern parts of the county, Cavode soils lie near the moderately well drained or somewhat poorly drained Cookport soils and the deep, well-drained Clymer soils. Cavode soils have a finer textured subsoil than Cookport and Clymer soils. Unlike Cookport soils, Cavode soils do not have a very firm, dense, brittle fragipan in the lower part of their subsoil.

Cavode soils are low in natural fertility and are very strongly acid. They have a moderate water-holding capacity. Aeration and internal drainage are somewhat poor. These soils are some of the most erodible in the county because the surface layer puddles and disperses easily, the subsoil is slowly permeable, and the substratum is tight clay shale.

**Cavode silt loam, 0 to 3 percent slopes** (CaA).—This is the soil described as typical of the Cavode series. The mapped areas of this soil include some Wharton soils and some Armagh soils that occur mainly as large seeps. The mapped areas in the northern and southwestern parts of the county include some soils that are underlain, at a depth of 36 to 50 inches, by thin beds of calcareous shale or limestone. The mapped areas in the western part include some better drained soils that formed in interbedded red and gray clay shale.

Internal drainage is slow below the surface layer, so this soil is saturated from time to time. Crops that tolerate wetness, therefore, grow best. Tile drains (fig. 10) installed with porous backfill help to improve this soil for cropland use. Diversion terraces or widely spaced, V-shaped ditches help where grade is sufficient and outlets are available. Diversion terraces at the base of adjacent slopes help to intercept the runoff that generally collects and stands on the surface of this soil. To maintain the structure of the plow layer, not more than 1 year of corn and at least 3 years of hay should be grown in a 5-year rotation. The surface layer is easily compacted if it is grazed or cultivated when wet. Heaving and winterkilling are serious hazards to alfalfa and winter grain.

This soil is well suited to timber production. It is somewhat poorly suited to development as a habitat for most kinds of wildlife. Because of a seasonal high water table and slow permeability, it is poorly suited to residential, commercial, light industrial, and institutional development. (Capability unit IIIw-1; woodland group 11; community development group 14)

**Cavode silt loam, 3 to 8 percent slopes, moderately eroded** (CaB2).—This soil has lost much of its original surface layer through erosion. Its dark yellowish-brown plow layer is a mixture of the remaining original surface layer and some former subsoil. Some small areas are only slightly eroded; others are severely eroded.

To reduce soil loss and to maintain the structure of the plow layer, it is advisable to grow at least 3 years of hay and not more than 1 year of row crops in a 5-year period. A cover crop should be grown with the row crop. The short slopes need to be planted on a grade that is sufficient to remove excess water but not steep enough to encourage erosion. The long slopes need diversions or graded terraces. Tile drains backfilled with permeable material help to drain seeps.

*Figure 10*.—Tile drains being installed on Cavode silt loam, 0 to 3 percent slopes, a poorly drained soil that is saturated from time to time.

This soil is well suited to timber production. It is somewhat poorly suited to development as a habitat for most kinds of wildlife. Because of a seasonal high water table and slow permeability, it is poorly suited to residential, commercial, light industrial, and institutional development. (Capability unit IIIw–2; woodland group 11; community development group 14)

**Cavode silt loam, 8 to 15 percent slopes, moderately eroded** (CaC2).—This soil occurs mostly as narrow strips between better drained soils. In most places it contains more fragments of shale or sandstone than the typical Cavode soil. Hard shale or sandstone is at a depth of 30 to 42 inches. There is little erosion in wooded areas.

To help prevent puddling and reduce soil loss, it is advisable to grow at least 3 years of hay and not more than 1 year of row crops in a 5-year period. A cover crop should be grown with the row crop. The short slopes need graded strips, and the long slopes need both graded strips and diversions. Tile drains help to remove water from seep spots.

This soil is well suited to timber production. It is somewhat poorly suited to development as a habitat for most kinds of wildlife. Because of seepage and slow permeability, it is poorly suited to residential, commercial, light industrial, and institutional development. (Capability unit IIIe–8; woodland group 11; community development group 14)

**Cavode silt loam, 15 to 25 percent slopes, moderately eroded** (CaD2).—This soil developed from clay shale in narrow strips between the Gilpin and Dekalb soils. It contains many small or medium, coarse fragments of shale or sandstone that were derived from the Gilpin and Dekalb soils. Its depth to hard shale or sandstone ranges from 30 to 36 inches. Some areas are only slightly eroded; others are severely eroded. The slightly eroded areas are mainly wooded.

This soil is best suited to use as hay land. Timothy, birdsfoot trefoil, and other grasses and legumes that tolerate wetness grow best. Cultivated crops can be grown for 1 year if 3 or 4 years of hay are included in the rotation. Diversions and graded strips are needed in cultivated areas. When reseeding hay, cross-slope strips should be used to help control erosion. Tile drains help to remove water in seep spots.

This soil is well suited to timber production. It is somewhat poorly suited to development as a habitat for most kinds of wildlife. Because of seepage, slow permeability, and moderately steep slopes, it is poorly suited to residential, light industrial, commercial, or institutional development. (Capability unit IVe–6; woodland group 11; community development group 14)

**Cavode silty clay loam, 8 to 15 percent slopes, severely eroded** (CcC3).—Erosion has removed most or all of the original surface layer. The plow layer, consequently, consists chiefly of former subsoil that is stained with organic matter. Shallow gullies have formed in many places. This soil is more shallow than the typical Cavode soil; depth to hard shale or sandstone ranges from 30 to 36 inches. The more clayey plow layer is easily compacted if this soil is tilled or grazed when wet. The loss of much soil and organic matter has reduced the water-holding capacity.

Because of the poor physical structure of the plow layer, the severe erosion hazard, the slow internal drainage, and the shallow root zone, this soil is best suited to use as hayland. Timothy, birdsfoot trefoil, and other grasses and legumes that tolerate wetness grow best. If a cultivated crop is grown, it should be followed by 3 years of hay. Tile drains help to remove water in seeps. Diversions are needed above the head of gullies. Fibrous rooted, close-growing grass, such as bluegrass, should be established in active gullies. Long slopes can be reseeded in graded strips.

This soil is well suited to timber production. It is somewhat poorly suited to development as a habitat for most kinds of wildlife and is poorly suited to residential, commercial, light industrial, or institutional development. (Capability unit IVe–6; woodland group 11; community development group 14)

**Cavode very stony silt loam, 0 to 8 percent slopes** (CdB).—This soil is similar to the one described as typical of the Cavode series, but it has not been plowed and has an accumulation of leaf litter and, below that, a mat of decayed leaves. Also, it has many large stones and boulders scattered on the surface and throughout its profile.

The expense of removing the boulders and of installing artificial drainage precludes uses other than pasture and woodland. Topdressing with lime and fertilizer helps to establish a good bluegrass-clover pasture.

This soil is well suited to timber production. It is somewhat poorly suited to development as a habitat for most kinds of wildlife. Because of a seasonal high water table, slow permeability and stoniness, it is poorly suited to residential, commercial, light industrial, or institutional development. (Capability unit VIs–3; woodland group 11; community development group 14)

**Cavode very stony silt loam, 8 to 25 percent slopes** (CdC).—This soil is shallower than Cavode very stony silt loam, 0 to 8 percent slopes; depth to hard shale or sandstone ranges from 30 to 42 inches. The erosion hazard is more severe because of steeper slopes.

This soil is best suited to extensive pasture or woodland. Pastures need to be limed and fertilized in amounts indicated by soil tests. Woodlands need to be protected from fire and grazing.

This soil is well suited to timber production. It is somewhat poorly suited to development as a habitat for most kinds of wildlife. Because of seeps, slow permeability, moderately steep slopes, and stoniness, it is poorly suited to residential, commercial, light industrial, or institutional development. (Capability unit VIs–3; woodland group 11; community development group 14)

## Clarksburg Series

The soils in this series are gently sloping and moderately sloping, medium textured, and moderately well drained or somewhat poorly drained. They formed in colluvial material of shale, sandstone, and limestone origin. These soils are mainly in the southwestern part of the county around Elders Ridge and West Lebanon.

The native vegetation consists of second-growth mixed hardwoods, including locust, elm, black cherry, red oak, black oak, walnut, hickory, and ash.

The plow layer of a typical Clarksburg soil is a very dark gray, very mellow silt loam. The upper part of the subsoil is a strong-brown silty clay loam that is sticky when wet. The lower part is a gray clay loam that has

many strong-brown mottles. This layer is very firm when moist and sticky when wet.

Profile of Clarksburg silt loam, 8 to 15 percent slopes, moderately eroded, in a cornfield a half mile south of West Lebanon:

Ap—0 to 9 inches, very dark gray (10YR 3/1) silt loam; weak, fine or medium, granular structure; very friable when moist, slightly sticky and slightly plastic when wet; neutral (pH 7.2) where limed; abrupt, smooth boundary; 8 to 10 inches thick. (Siltstone and sandstone fragments up to 10 inches in diameter make up 10 percent of this horizon.)

B21t—9 to 20 inches, strong-brown (7.5YR 5/6) silty clay loam; dark grayish-brown (10YR 4/2) ped exteriors; moderate, fine and medium, subangular blocky structure; friable when moist, sticky and plastic when wet; medium acid (pH 6.0); gradual, wavy boundary; 7 to 12 inches thick.

B22tg—20 to 25 inches, light brownish-gray (10YR 6/2) silty clay loam; common, medium, distinct, strong-brown (7.5YR 5/8) mottles; moderate, medium, subangular blocky structure; firm when moist, sticky and plastic when wet; thick, discontinuous clay films; common, black concretions; slightly acid (pH 6.2); diffuse, wavy boundary; 5 to 13 inches thick.

Bxg—25 to 38 inches, pinkish-gray (7.5YR 6/2) clay loam; gray (N 6/0) ped exteriors; many, medium, distinct, strong-brown (7.5YR 5/6) mottles; moderate, medium, prismatic structure breaking to weak, medium, platy structure; very firm when slightly moist, sticky and plastic when wet; thin, discontinuous clay films; common, black coatings and concretions; slightly acid (pH 6.5); diffuse, wavy boundary; 8 to 16 inches thick.

Cx—38 to 48 inches, dark-brown (7.5YR 4/4) silty clay loam; grayish-brown (10YR 5/2) ped exteriors; few, faint, brown (7.5YR 5/4) mottles; weak, coarse prismatic structure breaking to weak, medium, platy structure; very firm when slightly moist, sticky and plastic when wet; common, black concretions; neutral (pH 6.8); gradual, wavy boundary; 7 to 25 inches thick.

R—48 inches +, limestone interbedded with sandstone, siltstone, and shale.

The Ap horizon is channery in some places. The B horizon is silty clay loam or clay loam; it is finer textured with depth. It ranges from brown (7.5YR 5/4) to strong brown (7.5YR 5/6) in the upper part and from gray (N 6/0) to brown (10YR 5/3) in the lower part. The lower part is generally distinctly mottled. The depth to the shale, sandstone, or limestone ranges from 3 to 20 feet.

Clarksburg soils are on the lower valley slopes between the Guernsey, Westmoreland, and Gilpin soils on the uplands and the Atkins and Philo soils on the flood plains. They have stronger structure than the Guernsey soils and are coarser textured in the lower part of the subsoil. They are more poorly drained and deeper than the Westmoreland and Gilpin soils and have stronger horizonation than the Atkins and Philo soils.

Clarksburg soils are moderately fertile. They have a moderate water-holding capacity and are not easily leached. They are wet in spring and late in fall because the lower part of their subsoil is slowly permeable. Storm runoff is a hazard in cultivated fields.

**Clarksburg silt loam, 3 to 8 percent slopes, moderately eroded** (CkB2).—This soil is deeper than the one described as typical of the Clarksburg series. It occurs mostly in the lower part of narrow valley slopes. The areas look somewhat undulating because of many small natural draws. Much of the acreage is in pasture. Included in the mapped areas are some nearly level places, some slightly eroded places, and some severely eroded places.

Because of wetness, this soil is not suited to long-term alfalfa or winter grain. It is good for crops, but many areas are too small for profitable cultivation. To maintain soil structure and organic-matter content, it is advisable to grow at least 2 years of hay and not more than 1 year of corn in a 4-year period. Diversions at the base of adjacent slopes help to control runoff, and graded strips help to reduce erosion. A tile drainage system can be used to drain wet-weather springs and low spots. Grassed waterways are needed to stabilize natural draws.

This soil is very good for timber, and it can be developed as a habitat for open-land wildlife. Because of a seasonal high water table and slow permeability, it is only moderately well suited to residential, commercial, light industrial, and institutional development. (Capability unit IIe–4; woodland group 5; community development group 12)

**Clarksburg silt loam, 8 to 15 percent slopes, moderately eroded** (CkC2).—The profile of this soil is the one described as typical of the Clarksburg series. This soil occurs mostly in the lower part of narrow valley slopes and is used chiefly for pasture. It has lost much of its original surface layer through erosion. The plow layer, consequently, contains some former subsoil. Gullies and rills have formed. Included in the mapped areas are some slightly eroded places and some severely eroded ones.

The longer slopes are well suited to use as cropland but need special conservation measures to control erosion. A rotation that includes at least 3 years of hay and not more than 1 year of corn in a 5-year period helps to control erosion and to maintain soil structure. Diversions at the base of adjacent slopes help to intecept runoff, and graded strips help to remove excess water.

This soil is well suited to timber production. It is somewhat poorly suited to development as a habitat for most kinds of wildlife. Because of seeps and slow permeability, it is only moderately well suited to residential, commercial, light industrial, and institutional development. (Capability unit IIIe–6; woodland group 5; community development group 13)

## Clymer Series

The soils in this series are level to moderately steep, deep, medium textured, and well drained. They formed in material that weathered from acid sandstone and, to a lesser extent, from siltstone and shale. These soils occur mainly in the eastern and northern parts of the county. They are most extensive on the broad sandstone ridgetops around Luciusboro, Blaides, Strongstown, Uniontown, and Marchand. Because of their loose, loamy surface layer and their moderately high water-holding capacity, they are good soils for potatoes.

The native vegetation consists of second- and third-growth hardwoods, including red oak, white oak, black oak, scarlet oak, chestnut oak, red maple, black cherry, black birch, and white pine. Sassafras, cucumber, tulip-poplar, and hemlock grow in some places. Mountain-laurel, teaberry, greenbrier, and wild grapes are in the understory.

The plow layer of a typical Clymer soil is a very dark grayish-brown, very friable channery loam. The subsoil

is a yellowish-brown channery loam that is slightly sticky when wet. Many fragments of partly weathered sandstone occur below the subsoil, and hard rock is at a depth of 3 to 4½ feet.

Profile of Clymer channery loam, 0 to 5 percent slopes, moderately eroded, in a hayfield in North Mahoning Township, about 1 mile northwest of Marchand (This is profile S61Pa32-55(1-6), for which physical and chemical data are given in tables 11 and 12, pages 94 and 98.):

Ap—0 to 8 inches, very dark grayish-brown (10YR 3/2), gritty, channery loam; weak, fine, granular structure; very friable when moist; very strongly acid (pH 4.8); abrupt, smooth boundary; 7 to 10 inches thick. (Coarse fragments make up about 20 percent of this horizon.)

B21t—8 to 15 inches, yellowish-brown (10YR 5/6), gritty, channery loam; weak, fine, subangular blocky structure; friable when moist, slightly plastic and slightly sticky when wet; thin, discontinuous clay films; very strongly acid (pH 4.9); clear, wavy boundary; 6 to 9 inches thick. (Coarse fragments make up about 20 percent of this horizon.)

B22t—15 to 24 inches, strong-brown (7.5YR 5/6), gritty, very channery loam; weak, fine, subangular blocky structure; friable when moist, slightly sticky and slightly plastic when wet; thin, discontinuous clay films; very strongly acid (pH 4.7); gradual, wavy boundary; 8 to 12 inches thick. (Coarse fragments make up about 50 percent of this horizon.)

B3—24 to 36 inches, yellowish-brown (10YR 5/4), gritty, very channery sandy loam with lighter colored specks; weak, fine, subangular blocky structure; friable when moist, nonsticky and slightly plastic when wet; thin, patchy clay films; very strongly acid (pH 4.7); clear, irregular boundary; 2 to 14 inches thick. (Coarse fragments make up about 70 percent of this horizon.)

C1—36 to 42 inches, yellowish-brown (10YR 5/6), gritty, very channery coarse sandy loam; structureless; friable when moist; extremely acid (pH 4.1); gradual, irregular boundary; 4 to 8 inches thick. (Coarse fragments make up about 90 percent of this horizon. Material below a depth of 42 inches was not sampled.)

The A horizon is commonly channery loam but in some areas is channery sandy loam, very stony loam, or very stony sandy loam. The B horizon also is commonly channery loam but ranges from channery sandy clay loam to channery sandy loam; the texture generally gets coarser with depth. This horizon, in most places, is yellowish brown, brown, or strong brown, but its color range is yellowish brown (10YR 5/6) to reddish yellow (7.5YR 6/6). The depth to sandstone ranges from 3 to 4½ feet.

On the broad sandstone ridgetops, Clymer soils are near the shallow Ramsey soils, the moderately deep Dekalb soils, the moderately well drained or somewhat poorly drained Cookport soils, and the poorly drained Nolo soils. Where interbedded shale, siltstone and shale, or fine-grained sandstone overlie or underlie the massive, coarse-grained sandstone, Clymer soils are adjacent to the moderately deep Gilpin soils and the shallow Weikert soils. Where gray, yellowish-brown, or reddish-brown clay shale is interbedded, Clymer soils are near the moderately well drained Wharton soils and the somewhat poorly drained Cavode soils. Below Clymer soils in the valleys are the colluvial, moderately well drained or somewhat poorly drained Ernest soils and the poorly drained Brinkerton soils.

Clymer soils have a deeper, better developed subsoil than the Ramsey, Dekalb, and Weikert soils; and they have a deeper, more poorly developed, coarser textured subsoil than the Gilpin soils. Clymer soils do not have the mottled subsoil that is typical of the Cookport, Nolo, Wharton, Cavode, Ernest, and Brinkerton soils.

Clymer soils, except where stony, are favorable for farming because they are deep, well aerated, and well drained. Furthermore, they are easy to till and have a moderately high water-holding capacity. They are limited mainly in that they are very strongly acid and thoroughly leached. Frequent but moderate applications of lime and fertilizer, however, help to overcome these limitations.

**Clymer channery loam, 0 to 5 percent slopes, moderately eroded** (ClA2).—The profile of this soil is the one described as representative of the Clymer series. Wooded areas that have not been pastured remain uneroded or are only slightly eroded. In these areas, leaf litter, a leaf mat, a very dark gray organic layer, and a lighter colored mineral layer make up the uppermost 8 inches.

This soil is well suited to all the locally grown crops. In a 5-year period, at least 2 years of hay and not more than 2 years of row crops should be grown to maintain the organic-matter content and the structure of the plow layer. Farming on the contour helps to control erosion and to increase the amount of water taken in by the soil.

This soil is very well suited to timber production, and it can be developed as a habitat for both open-land and woodland wildlife. Depth to consolidated sandstone moderately limits its suitability for residential, commercial, light industrial, and institutional development. (Capability unit IIe-1; woodland group 4; community development group 1)

**Clymer channery loam, 5 to 12 percent slopes, moderately eroded** (ClB2).—Erosion has removed much of the fine material of the surface layer. Consequently, there is a high concentration of sandstone fragments in the plow layer. Small and medium-sized fragments make up about 30 percent of this layer. Many wooded areas remain uneroded or are only slightly eroded; in these areas the surface layer is darker colored.

This soil is well suited to use as cropland, but to maintain the organic-matter content and the structure of the surface layer, it is advisable to grow at least 2 years of hay and not more than 2 years of row crops in a 5-year period. Lime, fertilizer, and manure are needed to replace nutrients lost through erosion. Growing a cover crop with a row crop helps to control erosion and, at the same time, to increase the supply of organic matter. The long slopes need diversion terraces and contour strips to control runoff. The short slopes need only contour strips.

This soil is very good for timber, and it can be developed as a habitat for both open-land and woodland wildlife. Depth to bedrock moderately limits its suitability for residential, light industrial, commercial, and institutional development. Some slopes are too strong for streets and parking lots. (Capability unit IIe-1; woodland group 4; community development group 1)

**Clymer channery loam, 12 to 20 percent slopes, moderately eroded** (ClC2).—This soil is shallower than the typical Clymer soil. It has lost much of its original surface layer through erosion. Small and medium-sized

fragments of sandstone make up 40 percent or more of the plow layer, and hard sandstone is at a depth of only 3 to 3½ feet.

This soil is well suited to use as cropland, but to maintain the organic-matter content and the structure of the surface layer, it is advisable to grow at least 2 years of hay and not more than 1 year of row crops in a 4-year period. Growing a cover crop with a row crop helps to control erosion and, at the same time, to increase the supply of organic matter. Lime, fertilizer, and manure are needed to replace nutrients lost through erosion. The long slopes need diversion terraces and contour strips that control runoff. The short slopes need only contour strips.

This soil is very good for timber, and it can be developed as a habitat for both open-land and woodland wildlife. Slope and depth to bedrock moderately limit its suitability for residential, light industrial, commercial, or institutional development. (Capability unit IIIe-1; woodland group 4; community development group 2)

**Clymer very stony loam, 0 to 12 percent slopes** (CmB).—This soil has leaf litter and an organic mat overlying its surface layer. It is mostly wooded. It has so many large stones scattered on the surface that operating farm equipment is difficult. Pasture and woodland generally are the best uses of this soil. Topdressing with lime and fertilizer, mowing the weeds, and rotating the grazing are necessary to keep the pasture productive. In wooded pastures, most of the trees should be cut to increase the forage yield; or these areas should be fenced to keep livestock out.

This soil is well suited to the commercial production of timber and needs only good management to reach its potential. It is poorly suited to development as a habitat for wildlife. Slope, depth to bedrock, and stoniness moderately limit its suitability for residential, commercial, light industrial, or institutional development. (Capability unit VIs-1; woodland group 4; community development group 3)

**Clymer very stony loam, 12 to 35 percent slopes** (CmD).—This soil is underlain by sandstone at a depth of 36 to 42 inches. Because it is very stony, it is best suited to pasture and woodland. Topdressing with lime and fertilizer according to soil tests, mowing, rotating the grazing, and removing most of the trees help to increase the forage yield.

This soil is well suited to timber production. It is generally poorly suited to development as a habitat for wildlife. Slopes up to 25 percent are generally well suited to residential development, although the many large stones present problems. (Capability unit VIs-1; woodland group 4; community development group 4)

## Cookport Series

This series consists of moderately well drained or somewhat poorly drained, medium-textured soils on uplands. These soils formed in material that weathered from gray and brown, acid sandstone and, to a lesser extent, from shale and siltstone. They have a very firm, dense, brittle, slowly permeable layer, or fragipan, at a depth of 18 inches or more. They occur mostly on broad, somewhat concave ridgetops north and west of Trade City, near Uniontown, southwest of Cookport, and northeast of Strongstown. The slope range is 0 to 25 percent.

Second- and third-growth red maple and red, scarlet, black, and white oaks are the most common trees on these soils. Beech grows in some places.

The plow layer of a typical Cookport soil is a very dark gray, friable loam. The upper part of the subsoil is a yellowish-brown loam or clay loam that has some gray mottling, and the lower part is a dark-brown channery silt loam that has light brownish-gray and strong-brown vertical streaks and some gray mottling. This lower layer is a very firm fragipan.

Profile of Cookport loam, 0 to 3 percent slopes, in a hayfield about 4 miles east of Blairsville:

Ap—0 to 10 inches, very dark gray (10YR 3/1) loam; moderate, medium and fine, granular structure; friable when moist; slightly acid (pH 6.2) where limed; abrupt, smooth boundary; 7 to 10 inches thick. (Sandstone fragments up to 6 inches in diameter make up about 10 percent of this horizon.)

B1—10 to 14 inches, yellowish-brown (10YR 5/6) loam; weak, medium, subangular blocky structure; firm when moist; medium acid (pH 5.9); clear, smooth boundary; 3 to 6 inches thick.

B2—14 to 21 inches, yellowish-brown (10YR 5/8) channery clay loam; few, fine, distinct mottles of pale red (2.5YR 6/2); weak, medium, subangular blocky structure; friable when moist; strong-brown (7.5YR 5/8) ped exteriors; strongly acid (pH 5.2); clear, wavy boundary; 5 to 11 inches thick.

Bx—21 to 39 inches, dark-brown (10YR 4/3) channery silt loam; light brownish-gray (2.5Y 6/2) and strong-brown (7.5YR 5/8) vertical streaks; coarse polygons 15 inches long breaking to moderate, medium, platy structure; very firm when moist; strongly acid (pH 5.2); diffuse, irregular boundary; 7 to 18 inches thick.

C—39 to 48 inches, yellowish-brown (10YR 5/6) loam between beds of weathered flaggy sandstone and siltstone.

The B1 and B2 horizons range from yellowish brown (10YR 5/8) to strong brown (7.5YR 5/8) in color. Mottles in these horizons range from faint to distinct. The Bx horizon ranges from gray (N 5/0) to strong brown (7.5YR 5/6). Mottles and streaks in this horizon range from distinct to prominent. The texture of the B horizons ranges from loam to clay loam. The depth to the weathered sandstone and siltstone ranges from 30 to 48 inches. In many places, small to large fragments of sandstone are scattered on the surface and throughout the solum. Large boulders are common in many wooded areas.

The Cookport soils and the deep, well-drained Clymer soils share the broad, nearly level sandstone ridgetops in the eastern and northern parts of the county. Cookport soils are in the somewhat concave areas, and Clymer soils are in the better drained areas. Within the areas of the Cookport soils are the grayer, poorly drained Nolo soils. Nearby are the shallow to moderately deep, well-drained Dekalb and Ramsey soils; the well-drained, moderately deep Gilpin soils; and the shallow, well-drained Weikert soils. Adjacent to Cookport soils are the finer textured, moderately well drained Wharton soils and the somewhat poorly drained Cavode soils. Below Cookport soils, in valleys and natural draws, are the moderately well drained or somewhat poorly drained Ernest soils and the poorly drained Brinkerton soils.

Cookport soils are strongly acid and are low in natural fertility. They have a moderate water-holding capacity. During wet periods they are waterlogged above the

fragipan. The fragipan is poorly aerated, and it impedes root growth.

**Cookport loam, 0 to 3 percent slopes** (CoA).—The profile of this soil is the one described as typical of the Cookport series. Wharton and Cavode soils are included in the mapped areas of this soil.

This soil is suited to cultivation but needs artificial drainage. Even if drained it is not well suited to alfalfa and winter grains. Tile drains are effective where outlets are available and the grade is sufficient for drainage. A suitable cropping system for this soil is one that includes at least 2 years of hay and not more than 1 year of corn in a 4-year period. More frequent cultivation causes the surface layer to puddle.

Timber production is a good use for this soil, and much of the acreage can be developed into a moderately good habitat for wildlife. A seasonal high water table and moderately slow permeability in the lower part of the subsoil limit residential, light industrial, commercial, or institutional development. (Capability unit IIw–1; woodland group 8; community development group 12)

**Cookport loam, 3 to 8 percent slopes, moderately eroded** (CoB2).—This soil has lost much of its original very dark gray surface layer through erosion. The present plow layer is dark brown; it puddles more easily than that of the typical Cookport soil, and its capacity for holding water is less.

This soil is suited to use as cropland. It is not good for alfalfa because of poor internal drainage and a root-restricting fragipan. To help control erosion and maintain the structure of the surface layer, it is advisable to grow at least 2 years of hay and not more than 1 year of corn in a 4-year period. Diversion terraces and graded strips also help in controlling erosion. Tile drains can be used to remove water in seeps.

This soil is well suited to timber production. It is also well suited to development as a habitat for open-land wildlife. Because of a seasonal high water table and moderately slow permeability in the lower part of the subsoil, it is limited for residential, commercial, light industrial, or institutional development. (Capability unit IIe–5; woodland group 8; community development group 12)

**Cookport loam, 8 to 15 percent slopes, moderately eroded** (CoC2).—This soil has lost much of its original surface layer through erosion. Some of the yellowish-brown material in the upper part of the subsoil has been plowed with the remaining original surface layer. The plow layer, consequently, is dark brown instead of very dark gray like that of the typical Cookport soil. The fragipan is closer to the surface, and sandstone is at a depth of only 30 inches. Included in the mapped areas are some slightly eroded places and some severely eroded ones.

The need for diversions and graded strips is more urgent on this soil than on Cookport loam, 3 to 8 percent slopes, moderately eroded. Cover crops, manure, and fertilizer are needed to rebuild the structure and the water-holding capacity of the plow layer.

Timber production is a good use for this soil, and much of the acreage can be developed into a moderately good habitat for wildlife. Seeps, slopes, and moderately slow permeability in the lower part of the subsoil limit residential, commercial, light industrial, and institutional development. (Capability unit IIIe–7; woodland group 8; community development group 13)

**Cookport very stony loam, 0 to 8 percent slopes** (CpB).—This soil differs from the typical Cookport soil in that it is covered with leaf litter and is used mostly as woodland. Many large stones and boulders are scattered on the surface and throughout the solum.

Because of stoniness and poor internal drainage, pasture and woodland are the best uses for this soil. Topdressing the pasture with lime and fertilizer encourages the establishment of a good stand of bluegrass and clover, and it keeps the stand productive. When wet, this soil can be compacted by livestock; and compaction increases the erosion hazard.

This soil is well suited to timber production. It is poorly suited to development as a habitat for wildlife; and stoniness, a seasonal high water table, and moderately slow permeability in the lower part of the subsoil limit its suitability for residential, light industrial, commercial, or institutional development. (Capability unit VIs–1; woodland group 8; community development group 12)

**Cookport very stony loam, 8 to 25 percent slopes** (CpC).—This soil is shallower than Cookport very stony loam, 0 to 8 percent slopes. Depth to sandstone ranges from 30 to 36 inches. Some areas are moderately eroded, and some areas that have been excessively grazed are severely eroded.

Pasture and woodland are the best uses for this soil. Contour logging roads and a ditch and culvert system that removes excess water help to control erosion.

This soil is well suited to timber production. It is poorly suited to development as a habitat for wildlife; and because of a seasonal high water table, moderately slow permeability in the lower part of the subsoil, moderately steep slopes, and stoniness, it is limited for residential, light industrial, commercial, or institutional development. (Capability unit VIs–1; woodland group 8; community development group 13)

## Dekalb Series

The soils in this series are shallow or moderately deep, moderately coarse textured, and well drained. They formed in material that weathered from acid sandstone on the broad rolling ridgetops and steep valley slopes in the eastern and northern parts of the county. They are most extensive in the heavily wooded areas northeast of Lochvale and on the Chestnut Ridge, but large areas are near Cherry Tree, Uniontown, Spruce, Arcadia, and Marchand.

The native vegetation consists mainly of second- and third-growth hardwoods, including chestnut, scarlet, red, black, and white oaks; red maple; and black birch. Aspen, white pine, pitch pine, hemlock, black gum, and sassafras grow in some places. Mountain-laurel, teaberry, groundpine, greenbrier, and moss are in the understory. Huckleberry and laurel are typical of the shrubs that grow in idle fields.

The plow layer of a typical Dekalb soil is a very dark brown channery sandy loam. The subsoil is a yellowish-brown channery loam and extends to a depth of about 2 feet. It is sandier with depth. At a depth of about 2 or 3 feet is gray and brown, weathered sandstone; yellowish-brown sandy loam is in the cracks. Sandstone

fragments occur throughout the solum. Their number increases with depth.

Profile of Dekalb channery sandy loam, 5 to 12 percent slopes, moderately eroded, in a hayfield 2 miles north of Covode:

Ap—0 to 7 inches, very dark brown (10YR 2/2) channery sandy loam; weak, fine, granular structure; very friable when moist; slightly acid (pH 6.5) where limed; abrupt, smooth boundary; 6 to 9 inches thick. (Sandstone fragments up to 6 inches in diameter make up about 40 percent of this horizon.)

B2—7 to 15 inches, yellowish-brown (10YR 5/6) channery loam; weak, fine, subangular blocky structure; friable when moist, slightly sticky and nonplastic when wet; slightly acid (pH 6.3); gradual, wavy boundary; 7 to 15 inches thick. (Sandstone fragments up to 6 inches in diameter make up about 40 percent of this horizon.)

B3—15 to 23 inches, yellowish-brown (10YR 5/8) very channery sandy loam; weak, very fine, subangular blocky structure; very friable when moist; nonsticky and nonplastic when wet; strongly acid (pH 5.5); gradual, wavy boundary; 5 to 15 inches thick. (Sandstone fragments up to 6 inches in diameter make up about 60 percent of this horizon.)

C—23 inches +, gray and brown, weathered sandstone; yellowish-brown (10YR 5/8) sandy loam in voids between sandstone fragments.

The A horizon is commonly channery sandy loam but in many areas is channery loam, very stony loam, or very stony sandy loam. In wooded areas a discontinuous micropodzol horizon in the uppermost 2 to 6 inches is common. The B horizon ranges from brown (10YR 5/3) to yellowish brown (10YR 5/8) in color and from channery loam to channery or very channery sandy loam in texture. Soil reaction, except where lime has been added, is strongly acid or very strongly acid. The coarse fragments increase in abundance with depth. They make up as much as 90 percent of the C horizon. The depth to consolidated sandstone is 2 or 3 feet.

On the broad sandstone ridgetops, Dekalb soils are near the Clymer, Cookport, and Nolo soils. In the steeper valleys, they are intermixed with Ramsey soils. They are adjacent to the Gilpin, Weikert, Cavode, and Wharton soils and are above the Ernest and Brinkerton soils.

Dekalb soils are similar to Ramsey soils but are deeper to hard rock. Unlike the Clymer, Cookport, Nolo, Gilpin, Ernest, and Brinkerton soils, the Dekalb soils have a subsoil that shows little or no increase in silt and clay over that in the surface layer.

Dekalb soils have a low water-holding capacity and are strongly leached and somewhat droughty. They are low in natural fertility. Because of good internal drainage and good aeration, these soils warm early in spring. They are easy to work.

**Dekalb channery sandy loam, 0 to 5 percent slopes, moderately eroded** (DaA2).—This soil is on sandstone hilltops. It is easy to till, but the channery surface layer is hard on tillage equipment. Wooded areas generally are uneroded or only slightly eroded, and they are more acid.

This soil is suited to use as cropland if it is adequately limed and fertilized. Frequent and moderate applications of lime and fertilizer help to replace the nutrients lost through leaching. Applications of manure and careful management of organic-matter residues help to reduce droughtiness. A suitable rotation for this soil is one that includes not more than 2 years of row crops and at least 1 year of hay in a 4-year period. A winter cover crop should be grown with the row crop. Except on the long slopes, runoff and erosion can be reasonably controlled by contour cultivation.

This soil is moderately well suited to timber production. It is also moderately well suited to development as a habitat for open-land and woodland wildlife. Because of shallowness it is limited for residential, light industrial, commercial, or institutional development. (Capability unit IIs–1; woodland group 9; community development group 3)

**Dekalb channery sandy loam, 5 to 12 percent slopes, moderately eroded** (DaB2).—This soil is on the sloping hilltops and benches that are underlain by sandstone. Its profile is the one described as typical of the Dekalb series. Wooded areas are extensive. They have remained uneroded and have leaf litter and an organic mat overlying a pale surface layer. This soil is generally shallower to hard rock in areas adjacent to the steep valley slopes, in areas where the underlying sandstone was more resistant to weathering, and in areas that have been severely eroded.

This soil is somewhat droughty and is readily leached. It is suitable for use as cropland but needs careful management. A suitable rotation is one that includes at least 2 years of hay and not more than 1 year of row crops in a 4-year period. Contour strips and cover crops help to reduce runoff and erosion; diversions are an additional help on long slopes. Disking row-crop residues in fall helps to maintain tilth. This practice also helps to reduce erosion, for it increases the amount of water taken in by the soil. Frequent but moderate applications of lime and fertilizer help to replace elements lost through leaching.

This soil is moderately well suited to timber production. It is also moderately well suited to development as a habitat for open-land and woodland wildlife. Shallowness is a limitation for residential, light industrial, commercial, and institutional development. (Capability unit IIe–3; woodland group 9; community development group 3)

**Dekalb channery sandy loam, 12 to 20 percent slopes, moderately eroded** (DaC2).—This soil is on moderately steep hillsides and hilltops that are underlain by sandstone. It is generally shallower to sandstone than the typical Dekalb soil. Wooded areas that are not pastured are uneroded or are only slightly eroded. Some other areas, on the other hand, are severely eroded. In these areas, rills are common, and the very channery surface layer is lighter colored than that of the typical Dekalb soil.

Most of the general farm crops can be grown on this soil, but in a dry season such crops as corn and potatoes are adversely affected. This soil needs frequent applications of lime and fertilizer. For every year of row crops, it needs 3 years of hay. Its water-holding capacity can be increased by growing a cover crop with the row crop, by using contour strips, by disking row-crop residues, and by applying manure. These practices also help to reduce runoff and erosion. Diversions are an additional help on long slopes.

This soil is moderately well suited to timber production. It is also moderately well suited to development as a habitat for woodland wildlife. Shallowness and steepness limit its suitability for residential, light industrial, commercial, or institutional development. (Capability unit IIIe–3; woodland group 9; community development group 4)

**Dekalb very stony sandy loam, 0 to 12 percent slopes** (DbB).—This soil is practically all in wooded areas. It differs from the typical Dekalb soil in that it is very stony and uneroded. Leaf litter and a decomposed leaf mat 1 or 2 inches thick overlie a layer of grayish-brown sandy loam. This layer is about 2 inches thick, and it in turn overlies 6 or 7 inches of dark yellowish-brown channery sandy loam. Small, moderately eroded spots are included in the mapped areas.

Because it is very stony and somewhat droughty, this soil is best suited to use as woodland or for watershed protection. It is moderately well suited to timber production. It is poorly suited to development as a habitat for wildlife and is limited by shallowness and stoniness for residential, light industrial, commercial, and institutional development. (Capability unit VIs–2; woodland group 9; community development group 5)

**Dekalb-Gilpin very stony loams, 0 to 12 percent slopes** (DgB).—Dekalb very stony loam and Gilpin very stony loam occur in such an intricate pattern that separate mapping was not practical. They, therefore, were mapped together as a complex. The proportion of each soil in any area of this complex varies, but the Dekalb soil generally is dominant.

The soils of this mapping unit, for the most part, are wooded. An accumulation of leaf litter and a decayed leaf mat cover the surface layer, which is similar to that of the typical Dekalb soil or the typical Gilpin soil.

These soils are well suited to pasture and woodland. They are good for timber production. They are poorly suited to development as a habitat for wildlife and are limited by shallowness and stoniness for residential, light industrial, commercial, and institutional development. (Capability unit VIs–2; woodland group 9; community development group 5)

**Dekalb-Gilpin very stony loams, 12 to 35 percent slopes** (DgD).—The soils of this mapping unit generally are shallower than Dekalb-Gilpin very stony loams, 0 to 12 percent slopes. They are also steeper and, consequently, have greater runoff and erosion hazards. Most areas are wooded. Leaf litter and a partially decayed leaf mat cover the surface layer.

Because they are very stony and somewhat droughty, these soils are best suited to pasture and woodland. They are moderately good for timber production. They are not suited to development as a habitat for wildlife and are limited for residential, light industrial, commercial, and institutional development. (Capability unit VIs–2; woodland group 9; community development group 6)

**Dekalb-Gilpin very stony loams, 35 to 100 percent slopes** (DgF).—Hard rock underlies the soils of this mapping unit at a depth of 20 to 24 inches. Because of shallowness, stoniness, and steepness, these soils are best suited to use as woodland or for watershed protection. They are only fair for timber production. They are poorly suited to development as a habitat for wildlife but can be used as recreational areas. (Capability unit VIIs–1; woodland group 10; community development group 11)

**Dekalb and Ramsey channery sandy loams, 20 to 35 percent slopes, moderately eroded** (DkD2).—For both Dekalb channery sandy loam and Ramsey channery sandy loam, slope is the dominant feature affecting management. Separate mapping would have little practical significance, so these soils were mapped together as an undifferentiated group.

These soils are shallow or moderately deep. They occur mostly on steep hillsides. Wooded areas that are not pastured are uneroded or are only slightly eroded. Some other areas, on the other hand, are severely eroded. Rills and small gullies have formed in these areas, and many sandstone fragments are on the surface.

A suitable rotation for this mapping unit is one that includes 3 or 4 years of hay and not more than 1 year of corn in a 5-year period. Because of the low water-holding capacity of these soils, corn and other crops that need much water do not grow well in a dry season. Contour strips that are protected by diversion terraces help to reduce erosion and to conserve water. Frequent but moderate applications of lime and fertilizer help to replace elements lost through leaching.

These soils are fair for timber production. They are poorly suited to development as a habitat for wildlife and are limited for residential, commercial, light industrial, and institutional development. (Capability unit IVe–1; woodland group 14; community development group 11)

**Dekalb and Ramsey very stony sandy loams, 12 to 35 percent slopes** (DrD).—The soils of this mapping unit are mostly in wooded areas. They are underlain by hard rock at a depth of 12 to 30 inches. These soils are moderately steep, very stony, and shallow, and have leaf litter on the surface; otherwise they are similar to the typical Dekalb soil or the typical Ramsey soil. Included in the mapped areas are some small spots that are moderately eroded because they were excessively grazed.

These soils are best suited to use as pasture or woodland. They are fair for timber production. They are not suitable for development as a habitat for wildlife and are limited for residential, light industrial, commercial, and institutional development. (Capability unit VIs–2; woodland group 14; community development group 6)

## Ernest Series

The soils of this series are level to moderately steep, medium textured, and moderately well drained or somewhat poorly drained. They formed in material that slid or washed from nearby upland soils derived from acid shale, siltstone, and sandstone. Ernest soils are widely distributed throughout the county and occur as large areas near Indiana, Marion Center, and Shelocta. Mostly they are between the flood plain and the uplands; they occupy the lower part of valley slopes and the sides of bowl-shaped valleys. These soils are dissected by intermittent streams that are fed by runoff from the uplands.

The native vegetation consists of second- and third-growth mixed hardwoods. Red oak, black oak, white oak, tulip-poplar, hemlock, and red maple are common; and beech, ash, elm, black cherry, cucumber, ironwood, white pine, and sugar maple grow in some places. Spicebush, rhododendron, greenbrier, witch-hazel, dogwood, and viburnum make up the undergrowth. Blackberry, ironweed, elderberry, goldenrod, milkweed, and thorn bushes are common in open, idle fields.

The plow layer of a typical Ernest soil is a dark grayish-brown, friable silt loam. The upper part of the subsoil is a yellowish-brown silty clay loam that has a few grayish-brown and strong-brown mottles. The lower

part of the subsoil is light brownish-gray silty clay loam that has many strong-brown mottles. This lower layer is dense and firm and gets sandier with depth.

Profile of Ernest silt loam, 3 to 8 percent slopes, moderately eroded, in a hayfield in Rayne Township, 1 mile northeast of Home (Kellysburg). (This is profile S61-Pa32-51 (1-5), for which physical and chemical data are given in tables 11 and 12, pages 94 and 98.):

Ap—0 to 9 inches, dark grayish-brown (2.5Y 4/2) silt loam; moderate, fine and medium, granular structure; friable when moist, slightly sticky and slightly plastic when wet; slightly acid (pH 6.2) where limed; clear, smooth boundary; 7 to 10 inches thick.

B2t—9 to 17 inches, yellowish-brown (10YR 5/4) silty clay loam; few, fine, faint, light yellowish-brown (10YR 6/4) mottles; strong, fine and medium, subangular blocky structure; firm when moist, slightly sticky and slightly plastic when wet; thick discontinuous films of silt and clay; very strongly acid (pH 5.0); clear, wavy boundary; 5 to 10 inches thick.

Bx—17 to 26 inches, light brownish-gray (2.5Y 6/2) silty clay loam; common, fine and medium, distinct, strong-brown (7.5YR 5/6) mottles; strong, medium, prismatic structure breaking to medium and coarse blocky; firm or very firm when moist, sticky and plastic when wet; thick continuous films of silt and clay; very strongly acid (pH 4.9); gradual, wavy boundary; 6 to 13 inches thick.

B3g—26 to 35 inches, light brownish-gray (2.5Y 6/2) silty clay loam; many, medium and coarse, distinct, strong-brown (7.5YR 5/6) mottles; weak, medium, blocky structure; firm when moist, sticky and plastic when wet; patchy clay films; very strongly acid (pH 4.8); gradual, irregular boundary; 6 to 12 inches thick.

Cg—35 to 52 inches +, light-gray (2.5Y 7/2) loam; many, coarse, distinct, yellowish-brown (10YR 5/4) mottles; somewhat platy structure or massive; firm when moist, slightly sticky and slightly plastic when wet; common black coatings and concretions; strongly acid (pH 5.1). (Coarse fragments make up 35 percent of this horizon.)

The B horizon ranges from strong brown (7.5YR 5/6) to gray (N 6/0) in color. The upper part of this horizon generally is yellowish brown (10YR hue), and the lower part is grayish brown or light brownish gray (2.5Y hue). The lower part is distinctly or prominently mottled. The texture of this horizon is commonly silty clay loam but ranges from silt loam to silty clay. The depth to the C horizon ranges from 2½ to 5 feet, and the depth to shale, siltstone, and sandstone ranges from 3 to 20 feet. In many places, small to large stones are scattered on the surface and throughout the solum.

Within areas of Ernest soils are some poorly drained Brinkerton soils, which are grayer and more distinctly mottled below the plow layer than are the Ernest soils. On the uplands above the Ernest soils are Gilpin, Weikert, Wharton, Cavode, Cookport, Dekalb, Ramsey, and Clymer soils. Ernest soils differ from the Gilpin, Weikert, Dekalb, Ramsey, and Clymer soils in that they have a mottled subsoil. They are deeper to hard shale and sandstone than the Cavode and Wharton soils and have a finer textured subsoil than the Cookport soils. On the flood plains below Ernest soils are Atkins, Philo, and Pope soils. Ernest soils are not so gray and mottled below the surface layer as the Atkins soils, and they have a finer textured subsoil than the Philo and Pope soils.

Because of moderately slow permeability in the lower part of their subsoil, Ernest soils are waterlogged during wet seasons. They are naturally strongly acid or very strongly acid, are moderately low in natural fertility, and have a moderately high water-holding capacity. Their capacity for storing plant nutrients is good.

**Ernest silt loam, 0 to 3 percent slopes, moderately eroded** (ErA2).—Because it is level or nearly level, this soil remains waterlogged for a longer period in spring than the soil described as typical of the Ernest series. Included in the mapped areas of Ernest soils are small spots of deep, well drained soils and larger areas of moderately well drained soils that have a firm, dense fragipan. These included areas are mostly in the eastern and northeastern parts of the county.

This soil is well suited to cultivation but needs artificial drainage. Tile drains are effective in seepage areas and other wet spots. Diversion terraces at the base of the adjacent hillsides help to control runoff. A 4-year rotation that includes at least 2 years of hay and not more than 1 year of corn is needed to maintain the soil structure. Alfalfa and winter grains are likely to be damaged by heaving.

Timber production is a good use of this soil. Wooded areas generally are not subject to erosion. This soil can be developed as a habitat for open-land wildlife. Because of the slope, the moderately slow permeability in the lower part of the subsoil, and the depth to hard rock, it is suitable for farm ponds. A seasonal high water table and moderately slow permeability limit residential, commercial, light industrial, and institutional development. (Capability unit IIw-1; woodland group 8; community development group 12)

**Ernest silt loam, 3 to 8 percent slopes, moderately eroded** (ErB2).—The profile of this soil is the one described as typical of the Ernest series. Surface drainage is better on this soil than on the level and nearly level phase, but erosion is a greater hazard, except in wooded areas. Wooded areas on both soils generally are not subject to erosion.

This soil is well suited to farming, but alfalfa and winter grains are likely to be damaged by heaving. A 4-year rotation that includes 2 years of hay and 1 year of row crops is needed. Seeding a cover crop with a row crop not only helps to control erosion but also helps to improve structure and tilth. Diversions at the base of the adjacent uplands and graded strips across the slope help to control runoff.

This soil is well suited to timber production, and it can be developed as a habitat for open-land wildlife. A seasonal high water table and moderately slow permeability limit residential, light industrial, commercial, and institutional development. (Capability unit IIe-5; woodland group 8; community development group 12)

**Ernest silt loam, 3 to 8 percent slopes, severely eroded** (ErB3).—This soil has lost most of its original surface layer through erosion. The present plow layer is an organic-matter stained, dark yellowish-brown heavy silt loam or silty clay loam. It is slightly sticky when wet and hard and cloddy when dry; it is easily compacted. This layer is more quickly saturated than that of the typical Ernest soil, because the moderately slowly permeable subsoil is nearer the surface. In some places erosion has cut gullies down to the hard shale or sandstone.

This soil is good for crops, but large amounts of lime, fertilizer, and manure are needed to erase the bad effects

of erosion. A 5-year rotation that includes at least 3 years of hay and not more than 1 year of corn is needed to build up the structure of the surface layer. Seeding a cover crop with a row crop is necessary in most places. Diversion terraces are needed above most gullies, so that grass can be established in the gullies. In many places tile drains are needed to drain wet-weather springs that hinder the establishment of grass in the gullies. This soil puddles if it is grazed or tilled when wet.

This soil is well suited to timber production, and it can be developed as a moderately good habitat for woodland wildlife. A seasonal high water table and moderately slow permeability limit its suitability for residential, light industrial, commercial, and institutional development. (Capability unit IIIe–7; woodland group 8; community development group 12)

**Ernest silt loam, 8 to 15 percent slopes, moderately eroded** (ErC2).—Seeps are more common on this soil than on the typical Ernest soil. This soil is shallower. Erosion has removed much of the original surface layer, and plowing has mixed much of the yellowish-brown clay subsoil with the remaining surface layer. In some places, shale and sandstone fragments have slid or washed from the adjacent uplands. Erosion generally has not affected wooded areas.

A 5-year rotation that includes at least 3 years of hay and not more than 1 year of corn is needed to combat erosion. Diversion terraces on the adjacent uplands help to control runoff. Graded strips also help. Natural drainageways should be kept sodded when the land is tilled. Tile drains are effective in draining seep spots.

This soil is well suited to timber production. It is moderately well suited to development as a habitat for woodland wildlife. Seeps, moderately slow permeability, and strong slopes limit residential, commercial, light industrial, and institutional development. (Capability unit IIIe–7; woodland group 8; community development group 13)

**Ernest silt loam, 8 to 15 percent slopes, severely eroded** (ErC3).—This soil is more poorly drained than the typical Ernest soil, and it has a heavier textured surface layer. The plow layer is dark yellowish brown in color and is stained with organic matter. A moderately slowly permeable claypan is at a depth of 10 to 12 inches. Rills and gullies are common. During a wet period, water seeps out almost continually along the sides of some of the gullies that have been cut down to hard shale or sandstone. The water comes out above the claypan. The surface layer is easily compacted if it is grazed or tilled when wet. Some less eroded areas of this soil were included in mapping because these areas contain many natural gullies.

Perennial hay or pasture are good uses for this soil. Cultivated crops can be grown, but it is advisable to rotate them with small grain and hay. A 5-year rotation should include only 1 year of row crops and at least 3 years of hay. Birdsfoot trefoil makes better long-term hay than alfalfa. Diversion terraces at the base of the adjacent uplands and above the head of the gullies help to intercept runoff. When reseeding an area, graded strips help to control erosion. Tile drains can be used in seep spots to remove the excess water.

This soil is well suited to timber production, and it is moderately well suited to development as a habitat for woodland wildlife. Seeps, slopes, and moderately slow permeability limit residential, commercial, light industrial, and institutional development. (Capability unit IVe–5; woodland group 8; community development group 13)

**Ernest silt loam, 15 to 25 percent slopes, moderately eroded** (ErD2).—This soil is 3 to 6 feet deep to hard shale or sandstone. It is shallower than the typical Ernest soil and has a lighter colored plow layer. Also, it has more stone fragments on the surface and throughout the solum. Most of the area is on short slopes. Included in the mapped areas are some uneroded or slightly eroded woodlands and some small severely eroded spots. Also included are some Brinkerton soils in large seep spots.

This soil is well suited to hay and pasture. Wetness-tolerant grasses and legumes, such as timothy and birdsfoot trefoil, grow best. Topdressing with lime and fertilizer, in amounts determined by soil tests, helps to maintain a productive stand of hay and reduces the need for reseeding. If reseeding is necessary, using graded strips helps to control erosion. Tile drains can be used in seep spots to remove the excess water. Cultivated crops can be grown in a long rotation that includes 1 year of small grain and 3 years of hay.

This soil is well suited to timber production. It is moderately well suited to development as a habitat for wildlife. Slopes, seeps, and moderately slow permeability limit residential, commercial, light industrial, and institutional development. (Capability unit IVe–5; woodland group 8; community development group 13)

**Ernest very stony silt loam, 0 to 8 percent slopes** (EsB).—This soil is mostly wooded. It differs from the typical Ernest soil in having leaf litter and a decayed leaf mat overlying the surface layer. Included in the mapped areas are some soils that have a very firm, dense fragipan in the lower part of the subsoil and some deep, well-drained soils that developed in material similar to that in which the Ernest soils developed.

Because it is so stony, this soil is best suited to extensive pasture or woodland. Most of the trees should be removed if an area is to be used for pasture. Topdressing with lime and fertilizer encourages the establishment of bluegrass and clover. Restricting grazing when the soil is wet reduces compaction and controls runoff.

This soil is well suited to timber production. It is generally unsuitable as a habitat for wildlife, and because of a seasonal high water table, moderately slow permeability, and stoniness, it is limited for residential, light industrial, commercial, and institutional development. (Capability unit VIs–1; woodland group 8; community development group 12)

**Ernest very stony silt loam, 8 to 25 percent slopes** (EsC).—The runoff and erosion hazards are more severe on this soil than on Ernest very stony silt loam, 0 to 8 percent slopes, and the depth to hard rock is less.

Because it is very stony and moderately steep, this soil is best suited to pasture and woodland. Removing trees, topdressing with lime and fertilizer, and preventing overgrazing help to maintain a close-growing, productive pasture.

This soil is well suited to timber production. It is generally unsuitable for wildlife, and because of seeps, slopes, and moderately slow permeability, it is limited for residential, commercial, light industrial, and institutional development. (Capability unit VIs–1; woodland group 8; community development group 13)

## Gilpin Series

This series consists of level to very steep, moderately deep, well-drained, medium-textured soils on uplands. These soils formed in material that weathered from acid shale, siltstone, and sandstone. They are important agricultural soils and are the most extensive in Indiana County; they cover large areas around Hillsdale, Indiana, and Clarksburg (Lewisville). The native vegetation consists mostly of second- and third-growth hardwoods.

The plow layer of a typical Gilpin soil is a dark grayish-brown channery silt loam. The subsoil, which extends to a depth of about 2 feet, is a yellowish-brown channery silt loam. It is clayier and stickier than the surface layer. Below the subsoil there is partially weathered siltstone; dark grayish-brown loamy material is in the cracks.

Profile of Gilpin channery silt loam, 0 to 5 percent slopes, moderately eroded, in a hayfield in North Mahoning Township, half a mile southeast of Marchand (This is profile S61Pa32–56 (1–4), for which physical and chemical data are given in tables 11 and 12, pages 94 and 98.):

Ap—0 to 8 inches, dark grayish-brown (10YR 4/2) channery silt loam; weak, fine, granular structure; friable when moist; medium acid (pH 5.9) where limed; abrupt, smooth boundary; 7 to 10 inches thick. (Siltstone fragments make up 20 to 30 percent of this horizon.)

B1—8 to 13 inches, yellowish-brown (10YR 5/4) channery silt loam; weak, fine and medium, subangular blocky structure; friable when moist, slightly sticky and slightly plastic when wet; few clay films in pores; medium acid (pH 5.6); gradual, wavy boundary; 4 to 8 inches thick. (Siltstone fragments make up about 25 percent of this horizon.)

B2t—13 to 24 inches, yellowish-brown (10YR 5/6) channery silt loam; moderate, medium, subangular blocky structure; friable when moist, slightly sticky and slightly plastic when wet; thin clay films on ped faces and in pores; very strongly acid (pH 4.9); clear, irregular boundary; 9 to 14 inches thick. (Siltstone fragments make up 20 to 25 percent of this horizon.)

C—24 to 30 inches +, dark grayish-brown (2.5Y 4/2) loamy material that is about 90 percent partially weathered siltstone; numerous gray and black coatings on siltstone faces; few clay films on stone faces and in pores.

The A horizon is commonly channery silt loam, but it is shaly silt loam in some places and channery loam in other places. The B horizon is commonly channery silt loam, but it ranges from channery silt loam to channery silty clay loam. It is yellowish brown (10YR 5/4 or 5/6) in most places but ranges from yellowish brown (10YR 5/8) to dark brown (7.5YR 4/4). The depth to the acid, weathered, interbedded shale, siltstone, and sandstone ranges from 18 to 30 inches. The depth to hard shale, siltstone, and sandstone ranges from 24 to 48 inches.

The most extensive soils that occur near the Gilpin soils are the shallow, droughty Weikert soils. The Gilpin soils are deeper than the Weikert soils, and they have a siltier and clayier subsoil. On broad hilltops and benches, the Gilpin soils are near the Wharton and Cavode soils; they are better drained than the Wharton and Cavode soils and have less silt and clay in their subsoil. The Gilpin soils are also near the Dekalb, Ramsey, Clymer, and Cookport soils. Their subsoil is siltier and clayier than that of the Dekalb, Ramsey, and Clymer soils; thicker than that of the Ramsey soils; and not so thick as that of the Clymer soils. The Gilpin soils do not have a mottled subsoil or a brittle, compact layer like that in the Cookport soils.

In the western part of the county, Gilpin soils are near the reddish Upshur soils; they differ from Upshur soils in that they are coarser textured and mainly yellowish brown in color. In the southwestern part, Gilpin soils are next to the Westmoreland and Guernsey soils; they have less silt and clay in their subsoil and are more acid than the Westmoreland and Guernsey soils. Gilpin soils do not have the mottled subsoil that is typical of the Guernsey soils. On the lower valley slopes, Gilpin soils are above the Ernest and Brinkerton soils. The mottle-free subsoil of the Gilpin soils is less silty and less clayey than the mottled subsoil of the Ernest and Brinkerton soils.

Gilpin soils are naturally strongly acid at all depths and are low in natural fertility. Their capacity to hold water is moderately low; their capacity to hold and release plant nutrients is good. Aeration and internal drainage are good. Early tillage is possible.

**Gilpin channery silt loam, 0 to 5 percent slopes, moderately eroded** (GcA2).—This is the soil described as typical of the Gilpin series. Within areas of this soil are places where the plow layer is dark yellowish brown because erosion has removed much of the original surface layer. In wooded areas, leaf litter and an organic mat cover the surface layer.

This soil is well suited to most of the locally grown crops. On the long slopes, a suitable rotation is one that includes at least 1 year of hay and not more than 2 years of row crops in a 4-year period. A cover crop seeded in the row crop helps to protect the soil until planting time in spring. Contour farming and stripcropping help to control erosion and to increase the amount of water taken in by the soil.

This soil is well suited to timber production and moderately well suited to development as a habitat for openland and woodland wildlife. Shallowness, principally, limits residential, commercial, light industrial, and institutional development. (Capability unit IIs–1; woodland group 9; community development group 3)

**Gilpin channery silt loam, 5 to 12 percent slopes, moderately eroded** (GcB2).—This soil has lost much of its original surface layer through erosion. The plow layer, consequently, consists mostly of yellowish-brown material that was formerly part of the subsoil. Erosion has removed much organic matter and, thereby, has reduced the water-holding capacity. The surface layer is less mellow because of the loss of organic matter. Some small areas are only slightly eroded; some others are severely eroded.

This soil is well suited to most of the crops commonly grown in the county. A rotation that includes at least 2 years of hay and not more than 1 year of row crops in a 4-year period helps to improve the structure of the plow layer. Diversions and contour strips help to control runoff and erosion.

This soil is well suited to timber production and moderately well suited to development as a habitat for openland and woodland wildlife. Shallowness, mainly, limits residential, light industrial, commercial, and institutional development. (Capabiltiy unit IIe–3; woodland group 9; community development group 3)

**Gilpin channery silt loam, 12 to 20 percent slopes, moderately eroded** (GcC2).—This soil generally is shallower than the typical Gilpin soil, and it contains more stone fragments. Hard shale or sandstone is at a depth of 2 to 3½ feet. Wooded areas, for the most part, are uneroded and are somewhat deeper than cultivated or pastured areas. The surface layer in the wooded areas contains fewer coarse fragments. Some areas are severely eroded and have a dark yellowish-brown plow layer that contains more stone fragments than the plow layer in the moderately eroded areas.

This soil is suitable for use as cropland, but needs a rotation that is dominated by close-growing crops. A suitable rotation is one that includes at least 3 years of hay and not more than 1 year of row crops in a 5-year period. Contour strips help to control erosion. Diversions are helpful on the long slopes.

This soil is well suited to timber production. Generally, it is not suited or is poorly suited to development as a habitat for wildlife. Shallowness and the moderately steep slopes limit residential, light industrial, commercial, and institutional development. (Capability unit IIIe–3; woodland group 9; community development group 4)

**Gilpin channery silt loam, 20 to 35 percent slopes, moderately eroded** (GcD2).—This soil is similar to the typical Gilpin soil, but it commonly has a more channery or more shaly plow layer. Most areas are 2 to 3 feet deep to hard rock, but some uneroded wooded areas are deeper. Inclusions also are deeper. These are moderately steep, well-drained soils on uplands; moderately steep soils of mixed drainage that formed mainly in old colluvial deposits; soils of mixed drainage that formed in colluvium on slopes of 25 to 35 percent; and soils of mixed drainage that formed in bands of clay shale on slopes of 25 to 35 percent.

A 5-year rotation that includes not more than 1 year of cultivated crops and at least 3 years of hay is needed to guard against excessive erosion. Contour strips also help to control erosion; and, at the same time, they help to conserve water. Diversions are needed on the long slopes.

This soil is only fair for timber. It is poorly suited to development as a habitat for wildlife. Shallowness and steepness limit residential, light industrial, commercial, and institutional development. (Capability unit IVe–1; woodland group 9; community development group 11)

**Gilpin very stony silt loam, 0 to 12 percent slopes** (GnB).—This soil is mostly wooded. It has an accumulation of leaf litter and a leaf mat overlying the surface layer. Included in the mapped areas are some wooded pastures that are moderately eroded.

This soil is too stony for use as cropland, hayland, or tall-grass pasture, but it can be used for ordinary pasture or woodland. It is well suited to timber production. It is poorly suited to development as a habitat for wildlife and, because of shallowness and stoniness, is limited for residential, light industrial, commercial, and institutional development. (Capability unit VIs–2; woodland group 9; community development group 5)

**Gilpin very stony silt loam, 12 to 35 percent slopes** (GnD).—This soil is shallower to hard shale or sandstone than the typical Gilpin soil. Is is subject to more rapid runoff and to more severe erosion.

Because it is stony and somewhat droughty, this soil is best suited to extensive pasture and woodland. It is well suited to timber production but is poorly suited to development as a habitat for wildlife. Slopes, shallowness, and stoniness limit its suitability for residential, light industrial commercial, and institutional development. (Capability unit VIs–2; woodland group 9; community development group 6)

**Gilpin and Weikert channery silt loams, 35 to 70 percent slopes, moderately eroded** (GpE2).—For both Gilpin channery silt loam and Weikert channery silt loam, slope is the dominant feature affecting management. Separate mapping would have little practical significance, so these soils were mapped together as an undifferentiated group.

These soils are shallow or moderately deep. They occur mostly on steep and very steep hillsides. Wooded areas that are not pastured are uneroded or only slightly eroded, are deeper to hard rock, and have fewer stone fragments in the surface layer.

These soils are best suited to use as woodland. They are fairly well suited to timber production and generally poorly suited to development as a habitat for woodland wildlife. The steep slopes limit residential, commercial, light industrial, and institutional development. (Capability unit VIIe–1; woodland group 13; community development group 11)

**Gilpin and Weikert very stony silt loams, 35 to 100 percent slopes** (GrF).—These are shallow or moderately deep, well-drained soils on steep and very steep hillsides. Some rock outcrops and narrow bands of the moderately well drained Wharton soils and the somewhat poorly drained Cavode soils are included in the mapped areas.

These soils are suitable for use as woodland, but they are only fair for timber production. Wildlife or watershed protection are more practical uses in the remote areas. The steep slopes limit residential, light industrial, commercial, and institutional development. (Capability unit VIIs–1; woodland group 13; community development group 11)

**Gilpin-Weikert shaly silt loams, 0 to 5 percent slopes, moderately eroded** (GwA2).—The soils that make up this mapping unit were mapped together as a complex because they occur in such an intricate pattern that separate mapping is not practical. The proportion of each soil in any area is extremely variable, but the Gilpin soil generally is dominant.

These soils are shallow or moderately deep. They are widely scattered on hilltops and benches throughout the county and are extensive in some places. Generally, wooded areas that are not pastured have a darker colored surface layer than the typical Gilpin soil and the typical Weikert soil. In some areas, especially those that border steep valley slopes, erosion has removed most of the original surface layer, and the present plow layer is very shaly and dark yellowish brown in color.

These soils are suitable for use as cropland, but corn and other crops that require large amounts of water grow poorly in a dry year, especially where the Weikert soil is dominant. A 4-year rotation that includes 1 year of row crops and 2 years of hay helps to preserve good tilth. On the long slopes, stripcropping and contour farming help to conserve water and to control erosion, which is a moderate hazard.

The deeper areas are well suited to timber production, but the shallow areas are unsuitable. Most areas are

moderately well suited to development as a habitat for open-land and woodland wildlife. In some areas shallowness limits residential, light industrial, commercial, and institutional development. (Capability unit IIIs–1; woodland group 16; community development group 9)

**Gilpin-Weikert shaly silt loams, 5 to 12 percent slopes, moderately eroded** (GwB2).—These soils are shallow or moderately deep. They occur mostly on rounded hilltops and benches throughout the county; many areas are extensive. Many of the wooded areas are uneroded or are only slightly eroded, and some of the areas adjacent to steep valley slopes are severely eroded.

These soils are suitable for use as cropland. The Weikert soil, however, is droughty, and crop yields likely will be low in an area where this soil is dominant. A 5-year rotation that includes 1 year of corn and 3 years of hay helps to preserve good tilth and to control erosion, which is a moderate hazard. Contour strips and diversions help to conserve water and to control erosion on the long slopes. The short slopes need only contour strips.

Some of the deeper areas are well suited to timber production, but most areas are poorly suited. Most areas are moderately well suited to development as a habitat for open-land wildlife. In some areas shallowness limits residential, light industrial, commercial, and institutional development. (Capability unit IIIe–5; woodland group 16; community development group 9)

**Gilpin-Weikert shaly silt loams, 12 to 20 percent slopes, moderately eroded** (GwC2).—This mapping unit consists of shallow or moderately deep soils that occupy extensive areas on hilltops and hillsides throughout the county. Wooded areas generally are uneroded and have a less shaly, darker colored surface layer than cleared areas.

The soils in this mapping unit have a low or very low water-holding capacity. They are best suited to drought-resistant crops, such as orchardgrass, reed canarygrass, and birdsfoot trefoil. A row crop can be grown if followed by 1 year of oats or wheat and 3 years or more of hay. Contour strips and diversions are needed on the long slopes to help control erosion and conserve water. Only contour strips are needed on the short slopes.

These soils are poorly suited to timber production and to development as a habitat for woodland wildlife. Shallowness and the moderately steep slopes limit residential, light industrial, commercial, and institutional development. (Capability unit IVe–3; woodland group 16; community development group 10)

## Guernsey Series

This series consists of moderately well drained or somewhat poorly drained, medium-textured soils that formed in interbedded shale, siltstone, limestone, and calcareous clay shale. These soils are on broad, gently sloping and moderately sloping hilltops and benches in the Pittsburgh coal areas around West Lebanon, Elders Ridge, and Nowrytown.

The native vegetation consists of second- and third-growth hardwoods, such as black locust, black cherry, slippery elm, red oak, and white oak.

The plow layer of a typical Guernsey soil is a dark-brown, very mellow silt loam. It is underlain by a strong-brown, friable silt loam, and below that is a strong-brown, friable silty clay loam that is mottled with light brownish gray and yellowish red. The lower part of the subsoil is a mottled gray and brownish-yellow silty clay that is sticky and plastic when wet.

Profile of Guernsey silt loam, 3 to 8 percent slopes, moderately eroded, in an idle field 1.3 miles south of West Lebanon:

Ap—0 to 7 inches, dark-brown (7.5Y 4/4) silt loam; weak, fine, granular structure; very friable when moist, slightly sticky when wet; medium acid (pH 5.6); clear, wavy boundary; 6 to 9 inches thick.

B21t—7 to 12 inches, strong-brown (7.5YR 5/6) heavy silt loam; moderate, fine subangular blocky structure; friable when moist, slightly sticky and slightly plastic when wet; thin, discontinuous clay films on peds; medium acid (pH 5.7); clear, wavy boundary; 4 to 8 inches thick.

B22t—12 to 21 inches, strong-brown (7.5YR 5/8) silty clay loam; common, fine, distinct, yellowish-red (5YR 5/8) and light brownish-gray (10YR 6/2) mottles; moderate, fine or medium, blocky structure; thick, continuous clay films on peds; friable when moist, slightly sticky and slightly plastic when wet; few, fine, black concretions; medium acid (pH 5.6); clear, wavy boundary; 6 to 12 inches thick.

B23t—21 to 26 inches, brownish-yellow (10YR 6/6) silty clay; many, medium, distinct, pale-brown (10YR 6/3) and yellowish-red (5YR 5/8) mottles; weak, coarse polygons breaking to moderate, medium, blocky structure; firm when moist, sticky and plastic when wet; thin patchy clay films; few, fine, black concretions; medium acid (pH 5.8); gradual, wavy boundary; 3 to 6 inches thick.

B24—26 to 48 inches, gray (N 6/0) silty clay; common, medium, prominent, strong-brown (7.5YR 5/8) mottles; massive; very firm when moist, sticky and plastic when wet; common, medium, black concretions; medium acid (pH 6.0); gradual, wavy boundary; 6 to 22 inches thick.

C—48 inches +, gray (N 5/0), weathered, calcareous shale; neutral (pH 7.2).

The Ap horizon is most commonly dark-brown (7.5YR 4/2, 4/3, or 4/4) silt loam. The B horizon ranges from heavy silt loam to clay in texture; it is finer textured with depth. The upper part of the B horizon ranges from strong brown (7.5YR 5/6) to yellowish brown (10YR 5/6) in color but is mainly strong brown. The lower part ranges from brownish yellow (10YR 6/6) to gray (N 6/0) and is distinctly mottled. The depth to the C horizon ranges from 2 to 4 feet; and the depth to hard shale, sandstone, or limestone ranges from 2½ to 5 feet. In some areas, small and medium-sized fragments of stone are on the surface and throughout the solum.

Above and below the Guernsey soils are the sloping to steep, moderately deep, well-drained Westmoreland soils. Adjacent to the Guernsey soils in some places are the moderately deep, well-drained Gilpin soils. Below the Guernsey soils in the valleys are the deeper, colluvial Clarksburg soils. Guernsey soils are browner in the upper part of the subsoil and have more silt and clay in the lower part than the Westmoreland and Gilpin soils. The lower part of their subsoil is mottled and slowly permeable, unlike that of the Westmoreland and Gilpin soils, and it is massive compared to the firm, compact, platy subsoil of the Clarksburg soils.

Guernsey soils have moderate water-holding capacity. They are moderate in natural fertility and respond well to lime and fertilizer. They are not easily leached. Their water table is seasonally high because of slow permeability in the lower part of their subsoil.

**Guernsey silt loam, 3 to 8 percent slopes, moderately eroded** (GyB2).—The profile of this soil is the one described as typical of the Guernsey series. Included in the mapped areas are small, level and nearly level places; some slightly eroded places; and some severely eroded places.

Crops that tolerate wetness grow best on this soil. Birdsfoot trefoil is the best legume for perennial hay. Winter grain and alfalfa are subject to heaving. Alfalfa, nevertheless, can be grown in short rotations with hay. A 4-year rotation that includes at least 2 years of hay and not more than 1 year of cultivated crops is needed to help maintain soil structure and control erosion. Graded strips are needed on the short slopes to intercept runoff and thereby reduce erosion. The long slopes, in addition to graded strips, need diversion terraces. Tile drains effectively remove water in seeps.

This soil is well suited to timber production and to development as a habitat for open-land wildlife. A seasonal high water table and slow permeability limit its suitability for residential, light industrial, commercial, and institutional development. (Capability unit IIe-4; woodland group 5; community development group 12)

**Guernsey silt loam, 8 to 15 percent slopes, severely eroded** (GyC3).—The plow layer of this soil consists mostly of former subsoil material. In most places it is an organic matter stained, brown silt loam, but in the more severely eroded places it is a strong-brown silty clay loam and is dissected by many small gullies and rills. The plow layer is hard and cloddy when dry and sticky when wet. The massive, slowly permeable, compact layer is nearer the surface in this soil than in the typical Guernsey soil. Included in the mapped areas are small, slightly eroded places and some moderately eroded places.

This soil is mainly on short slopes. Because it is wet, difficult to till, and low in content of organic matter, it is best suited to perennial hay that has been reseeded in small grain. Cultivated crops can be grown, but the rotation should be a long one, for example, 1 year of row crops and 4 years or more of hay. Birdsfoot trefoil, Ladino clover and timothy, or reed canarygrass are ideal hay crops for this soil. Tiles are needed to drain the wet-weather springs that keep many of the gullies active. Diversions at the head of the gullies or at the base of the adjacent slopes and graded strips help to intercept runoff and to control erosion, which is a severe hazard. Grassed waterways are needed to stabilize the gullies and rills.

This soil is well suited to timber production and is poorly suited to development as a habitat for open-land and woodland wildlife. A seasonal high water table, slow permeability, and slopes limit its suitability for residential, light industrial, commercial, or institutional development. (Capability unit IVe-4; woodland group 5; community development group 13)

## Made Land

Made land (Ma) is a miscellaneous land type that consists of areas where the soil material has been covered, moved, or graded by man. It includes areas that have been altered for gas wells, highways, athletic fields, parking lots, factory sites, or housing developments.

In some areas the original soil has been covered or destroyed by earth-moving operations, but it is not beyond reclamation. If restored to productivity, these areas can be used for hay.

In other areas most or all of the soil material has been removed, and hard shale or sandstone is at the surface. To establish vegetation in these areas, soil material has to be added. (Capability units IVs-2 and VIIIs-1; community development group 16)

## Mine Dumps

Mine dumps (Md) is a miscellaneous land type that consists of waste piles of low-grade coal, carbonaceous shale, and ashes (fig. 11). Prominent areas of Mine dumps occur near Tide, east of Homer City, southwest of Ernest, northeast of Clymer, southwest of Smokeless, and west of McIntyre. Included in the mapped areas are a slag area north of Black Lick, ash and slag fills in large railroad yards east of Blairsville, and small areas on flood plains that are covered with debris from coal-mining operations.

Most areas of Mine dumps are devoid of vegetation or have only sparse vegetation. All areas are highly susceptible to erosion. The material that is removed by erosion clogs stream channels and collects behind the large flood-control dams. Water that drains from the mine dumps carries sulfur and iron compounds that pollute the streams.

Quaking aspen and ailanthus grow naturally in some places, but a close-growing vegetative cover is needed to stabilize these areas. Experimental plantings can best determine what plants and what treatment will provide this cover. (Capability unit VIIIs-1; community development group 16)

## Monongahela Series

This series consists of well-developed, moderately well drained or somewhat poorly drained, medium-textured soils that formed in old, acid deposits. These soils cover most of the broad flats around Homer City, Graceton, Black Lick, Strangford, and Blairsville and are extensive near Shelocta.

The native vegetation consists of second- and third-growth hardwoods, including white oak, red oak, black

*Figure 11.*—**An old barren mine dump in the background and debris from deep-mining operations in the foreground. Areas such as this generally do not support vegetation, and a vegetative cover is needed to stabilize them.**

oak, hickory, beech, tulip-poplar, black cherry, elm, and sycamore.

The plow layer of a typical Monongahela soil is a very dark grayish-brown, friable silt loam. It is underlain by a yellowish-brown silt loam that is slightly sticky when wet. Below a depth of about 14 inches is a mottled gray silty clay loam. The mottling increases with depth. At a depth of about 2 feet is a light brownish-gray silty clay loam that is mottled with gray and yellowish red. This lower layer is a dense, firm fragipan.

Profile of Monongahela silt loam, 0 to 3 percent slopes, in an idle area 1 mile southwest of Coral:

Ap—0 to 7 inches, very dark grayish-brown (10YR 3/2) silt loam; weak, fine, granular structure; friable when moist, slightly sticky when wet; neutral (pH 6.9) where limed; abrupt, smooth boundary; 6 to 10 inches thick.

B1—7 to 9 inches, yellowish-brown (10YR 5/6) silt loam; weak, fine, granular structure; partial clay films; friable when moist, slightly sticky when wet; slightly acid (pH 6.4); clear, wavy boundary; 1 to 4 inches thick.

B21—9 to 14 inches, yellowish-brown (10YR 5/6) silt loam; weak, fine, subangular blocky structure; friable when moist, slightly sticky and slightly plastic when wet; thin, discontinuous clay films; strongly acid (pH 5.3); clear, wavy boundary; 4 to 10 inches thick.

B22tg—14 to 18 inches, yellowish-brown (10YR 5/8) silty clay loam; common, fine, distinct, strong-brown (7.5YR 5/6) mottles; gray (N 6/1) ped exteriors; moderate, medium and fine, blocky structure; firm when moist, sticky and plastic when wet; thin, continuous clay films on peds; strongly acid (pH 5.4); clear, wavy boundary; 3 to 10 inches thick.

B23tg—18 to 25 inches, gray (N 6/1) silty clay loam; many, medium, prominent, yellowish-red (5YR 5/6) and yellowish-brown (10YR 5/8) mottles; moderate, medium, platy structure; firm and dense when moist, sticky and plastic when wet; common, black concretions; thick, patchy clay films; strongly acid (pH 5.4); clear, wavy boundary; 4 to 8 inches thick.

Bxg—25 to 34 inches, light brownish-gray (10YR 6/2) clay loam; many, coarse, distinct yellowish-red (5YR 5/6) and gray (N 6/1) mottles; moderate, medium, platy structure; very firm and dense when moist, sticky and plastic when wet; common, black concretions; thick, continuous, grayish-brown (10YR 5/2) clay films on peds; strongly acid (pH 5.5); clear, wavy boundary; 6 to 12 inches thick.

B3—34 to 44 inches, brown (10YR 5/3) silty clay loam; many, medium, distinct, yellowish-red (5YR 5/6) and light brownish-gray (10YR 6/2) mottles; moderate, coarse, blocky structure; thin, continuous, grayish-brown (10YR 5/2) clay films on peds; very firm when moist, sticky and plastic when wet; common, black concretions; strongly acid (pH 5.5); clear, irregular boundary; 6 to 11 inches thick.

C—44 inches +, stratified beds of silt, fine sand, and clay.

The Ap horizon is commonly silt loam, though in some small areas it is loam or gravelly fine sandy loam. The texture of the B horizon ranges from silt loam to silty clay loam; it gets finer with depth. The color of the B horizon ranges from yellowish brown (10YR 5/8) in the upper part to gray (N 6/1) in the lower part. The lower part is prominently or distinctly mottled. The depth to the stratified material ranges from 3 to 4½ feet; and the depth to hard shale or sandstone ranges from 4 to 20 feet.

On the broad terraces, Monongahela soils are near the well-drained Allegheny soils, the moderately well drained or somewhat poorly drained Tygart soils, and the poorly drained Purdy soils. Adjacent to escarpments and upland slopes, they are near the Gilpin, Weikert, Ramsey, and Dekalb soils. Where the terraces border the colluvial lower valley slopes, Monongahela soils are near the Ernest soils.

Monongahela soils are less silty and clayey than the Tygart and Purdy soils. They are more silty and clayey than the Gilpin, Weikert, Ramsey, and Dekalb soils; and they have a deeper subsoil. They have a more silty and clayey subsoil than the Allegheny soils. Unlike the Allegheny soils, they have a fragipan. Their fragipan is much firmer and more brittle than that of the Ernest soils.

Monongahela soils have a moderately high water-holding capacity. They are strongly acid, and they are low in natural fertility but are not readily leached. Permeability in the lower part of the subsoil is moderately slow because of the fragipan.

**Monongahela silt loam, 0 to 3 percent slopes, moderately eroded** (MoA2).—This soil has lost some organic matter and, consequently, its plow layer is dark grayish brown instead of very dark grayish brown like that of the typical Monongahela soil. Included in the mapped areas are some slightly eroded and some severely eroded places. Some areas above the Conemaugh and Mahoning flood-control reservoirs are also included. These areas are subject to flooding when the reservoirs are at maximum storage.

This soil is best suited to legumes and grasses that tolerate wetness, for example, timothy, reed canarygrass, birdsfoot trefoil, and Ladino clover. Alfalfa, winter grain, and potatoes are often damaged because of seasonal wetness. A rotation that includes at least 2 years of hay and not more than 1 year of corn in a 4-year period is needed to maintain the organic-matter supply and the structure of the plow layer. Tile drains are effective in removing excess water from low spots and seeps. Diversions at the base of the adjacent slopes help to intercept runoff. Open ditches or grassed waterways may be needed in some places.

This soil is well suited to timber production and to development as a habitat for open-land wildlife. A seasonal high water table and moderately slow permeability limit its suitability for residential, light industrial, commercial, and institutional development. (Capability unit IIw–1; woodland group 8; community development group 12)

**Monongahela silt loam, 3 to 8 percent slopes, moderately eroded** (MoB2).—This soil has lost much organic matter and, consequently, its plow layer is dark grayish brown to dark brown instead of very dark grayish brown like that of the typical Monongahela soil. Included in the mapped areas are some severely eroded and gullied places.

This soil is suited to use as cropland but needs management that protects it from erosion. A suitable rotation includes at least 2 years of hay and not more than 1 year of corn in a 4-year period. A cover crop can be seeded in the corn. Short slopes should be planted on a grade strong enough to remove excess water but not enough to encourage erosion. Diversions and graded strips are needed on the longer slopes. Tiles can be used to drain seeps and low spots.

This soil is well suited to timber production and to development as a habitat for open-land wildlife. A seasonal high water table and moderately slow permeability limit its suitability for residential, light industrial, commercial, and institutional development. (Capability unit IIe-5; woodland group 8; community development group 12)

**Monongahela silt loam, 8 to 15 percent slopes, moderately eroded** (MoC2).—This soil is mostly on short slopes. It has a dark yellowish-brown plow layer, and it is shallower than the typical Monongahela soil. The fragipan is at a depth of about 18 inches, and the stratified material at a depth of 36 to 42 inches. Wooded areas are uneroded or are only slightly eroded, but there are other areas that are severely eroded.

This soil is suited to use as a cropland but needs erosion control practices. A 5-year rotation that includes at least 3 years of hay and not more than 1 year of corn helps to control erosion. A cover crop seeded in the corn is a further help. Graded strips and diversions on or at the base of the adjacent slopes help to remove surface water. Diversions are needed at the head of gullies so that grass can be established in the gullies. Tile drains are effective in drying up seeps.

This soil is well suited to timber production and is moderately well suited to development as a habitat for woodland wildlife. A seasonal high water table, moderately slow permeability, and slopes limit its suitability for residential, light industrial, commercial, and institutional development. (Capability unit IIIe-7; woodland group 8; community development group 13)

## Nolo Series

This series consists of grayish, poorly drained, medium-textured soils that formed in material weathered from acid, gray sandstone and, to a lesser extent, shale and siltstone. These soils occur mainly in small depressions on the broad, flat sandstone ridgetops in the northern and eastern parts of the county. The more extensive areas are near Bowdertown, Arcadia, Uniontown, and Strongstown.

The native vegetation consists of second- and third-growth hardwoods and conifers, including red oak, black oak, hemlock, white pine, beech, hickory, yellow birch, and red maple. Swamp grass is common in cleared areas.

The plow layer of a typical Nolo soil is a very dark grayish-brown silt loam. The upper part of the subsoil is a mottled light brownish-gray, brown, and yellowish-red silty clay loam that is slightly sticky when wet. The lower part is a grayish-brown clay loam mottled with brown. A firm, brittle fragipan is at a depth of about 2 feet. It is a dark-brown sandy clay loam mottled with light brownish gray. Weathered gray and brown sandstone lies below the fragipan.

Profile of Nolo silt loam, 0 to 3 percent slopes, in a pasture 3 miles south of Glen Campbell:

Ap—0 to 6 inches, very dark grayish-brown (2.5Y 3/2) silt loam; few, fine, distinct, dark-brown (7.5YR 4/4) mottles; weak, fine, granular and subangular blocky structure; friable when moist; strongly acid (pH 5.2); abrupt, smooth boundary; 6 to 8 inches thick. (Sandstone fragments up to 8 inches in diameter make up 5 percent of this horizon.)

B21t—6 to 17 inches, brown (10YR 5/3) clay loam; many, fine, distinct, yellowish-red (5YR 5/6) and light brownish-gray (10YR 6/2) mottles; moderate, medium and fine, subangular blocky structure; firm when moist, sticky and plastic when wet; thin, continuous clay films; very strongly acid (pH 5.0); clear, wavy boundary; 8 to 14 inches thick. (Sandstone fragments up to 8 inches in diameter make up about 5 percent of this horizon.)

Bx1—17 to 25 inches, grayish-brown (2.5Y 5/2) clay loam; many, medium, distinct, strong-brown (7.5YR 5/6) mottles; moderate, medium and coarse, prismatic structure breaking to moderate, medium, platy structure; firm or very firm when moist, sticky and plastic when wet; thick, continuous clay films; common, fine, black concretions; very strongly acid (pH 5.0); gradual, wavy boundary; 4 to 9 inches thick.

Bx2—25 to 40 inches, dark-brown (7.5YR 4/4) sandy clay loam; many, medium and coarse, distinct, light brownish-gray (2.5Y 6/2) mottles; coarse prismatic structure breaking to moderate, medium, platy structure; very firm when moist, sticky and plastic when wet; thick deposits of silt and clay on ped faces; many, fine, black concretions; very strongly acid (pH 5.0); gradual, wavy boundary; 10 to 20 inches thick.

R—40 inches +, gray and brown, weathered sandstone; acid.

The texture of the A horizon is commonly silt loam but is loam or sandy loam in some places. The texture of the B horizon is clay loam or sandy clay loam. The upper part of the B horizon is commonly brown (10YR 5/3) but ranges from pale brown (10YR 6/3) to strong brown (7.5YR 5/6). The lower part ranges from light gray (2.5Y 7/2) to dark brown (7.5YR 4/4). Both the upper and the lower parts are distinctly mottled. In many areas, sandstone fragments of various sizes are scattered on the surface and throughout the solum.

Nolo soils commonly occur as small areas within areas of Cookport soils; are near the Dekalb, Ramsey, and Clymer soils; and are above the Brinkerton and Ernest soils that are in the valleys. Where clay shale overlies sandstone, Nolo soils intergrade to Armagh and Cavode soils. Nolo soils are grayer and more distinctly mottled in the upper part of the subsoil than Cookport, Cavode, and Ernest soils. They have a more silty and clayey subsoil than the nonmottled Dekalb, Ramsey, and Clymer soils; and they are sandier in the lower part of the subsoil than the Armagh and Brinkerton soils. Nolo soils further differ from the associated soils, except the Cookport, in that they have a fragipan.

Nolo soils are slowly permeable below the plow layer. They have a moderate water-holding capacity and are low in natural fertility. They are subject to light leaching, and are poorly aerated.

**Nolo silt loam, 0 to 3 percent slopes** (NoA).—This is the soil described as typical of the Nolo series. Much of it is in woodlands where the surface layer is covered with an organic mat and, above that, leaf litter.

If drained by means of open ditches, this soil is suitable for hay. It can be used for cultivated crops that tolerate wetness, but it needs more intensive drainage. The grasses and legumes that grow best are reed canarygrass, birdsfoot trefoil, and others that tolerate wetness. Tile drains and diversions on or at the base of the adjacent slopes help to carry away the subsurface seepage and the excess surface water that normally collects on this soil.

This soil is only fair for timber production, but it can be developed as a moderately good habitat for wetland wildlife. A high water table and slow permeability severely limit residential, light industrial, commercial, and institu-

tional development. (Capability unit IVw-1; woodland group 12; community development group 14)

**Nolo silt loam, 3 to 8 percent slopes** (NoB).—Surface drainage is somewhat better on this soil than on Nolo silt loam, 0 to 3 percent slopes. Furthermore, drainage systems and outlets are easier to install because of the stronger slopes.

Cultivated crops that tolerate wetness can be grown if the soil is adequately drained. Grasses and legumes that tolerate long periods of wetness also can be grown, and they can be grown in areas that are less intensively drained. Graded strips and diversions help to remove surface water and to reduce erosion.

This soil is only fair for timber production, and it is poorly suited to development as a habitat for wildlife. A high water table and slow permeability severely limit residential, light industrial, commercial, and institutional development. (Capability unit IVw-2; woodland group 12; community development group 14)

## Philo Series

This series consists of moderately well drained or somewhat poorly drained, medium-textured soils that formed in stratified alluvium of acid sandstone, siltstone, and shale origin. These soils cover most of the flood plains along the larger creeks in the county; and though flooded occasionally to frequently, they are important to agriculture.

The native vegetation consists of second- and third-growth hardwoods, including elm, hickory, ash, red oak, black oak, and maple. Hemlock, white pine, and sycamore grow in some places.

The surface layer of a typical Philo soil is a very dark grayish-brown, friable silt loam. It is underlain by a dark yellowish-brown silt loam that extends to a depth of about 17 inches. Below that is a mottled dark grayish-brown and yellowish-red fine silt loam. A typical Philo soil gets grayer with depth.

Profile of Philo silt loam (0 to 5 percent slopes) in a cornfield 1½ miles west of Indiana:

Ap—0 to 8 inches, very dark grayish-brown (10YR 3/2) silt loam; weak, fine, granular structure; very friable when moist; medium acid (pH 6.0) where limed; abrupt, smooth boundary; 7 to 9 inches thick.

C1—8 to 17 inches, dark yellowish-brown (10YR 4/4) silt loam; weak, fine, granular structure; friable when moist, slightly sticky and slightly plastic when wet; medium acid (pH 5.8); clear, wavy boundary; 6 to 15 inches thick.

C2—17 to 27 inches, dark grayish-brown (10YR 4/2) heavy silt loam; many, fine and medium, distinct, yellowish-red (5YR 4/6) mottles; weak, fine, subangular blocky structure; friable when moist, slightly sticky and slightly plastic when wet; medium acid (pH 5.6); clear, wavy boundary; 8 to 20 inches thick.

C3g—27 to 37 inches, gray (10YR 5/1) heavy silt loam; many, fine and medium, distinct, yellowish-red (5YR 4/6) mottles; massive; friable when moist, slightly sticky and slightly plastic when wet; strongly acid (pH 5.4); clear, wavy boundary; 3 to 12 inches thick.

IIC—37 inches +, stratified silt, sand, and clay.

The texture of the A horizon is commonly silt loam but is gravelly sandy loam in some small areas. The texture of the C horizon ranges from silty clay loam to sandy loam. It is commonly heavy silt loam in the upper part and gets coarser with depth. The upper part of the C horizon is commonly dark yellowish brown (10YR 4/4) but ranges from dark brown (10YR 4/3) to yellowish brown (10YR 5/6). The lower part ranges from gray (10YR 5/1) to dark gray (10 YR 4/2). Distinct mottling begins at a depth of about 17 inches. The depth to the stratified material ranges from 3 to 4 feet, and the depth to hard shale or sandstone ranges from 4 to 12 feet. In some areas, gravel and stones are scattered on the surface and throughout the solum.

Philo soils are adjacent to the Atkins and Pope soils, which are also on flood plains, and to the Allegheny, Monongahela, Purdy, and Tygart soils. Philo soils are not so gray or distinctly mottled in the upper part of the subsoil as the Atkins, Purdy, and Brinkerton soils. They have a less silty and clayey subsoil than the Monongahela, Tygart, and Ernest soils; and unlike the Allegheny soils, they have a mottled subsoil.

Philo soils have a seasonal high water table but are moderately permeable below the surface layer. They have a moderately high water-holding capacity and are moderate in natural fertility. They receive soil deposits in many areas, when the streams overflow, but are not much affected by erosion, except along streambanks.

**Philo silt loam** (Ph).—The profile of this soil is the one described as typical of the Philo series. Some small areas of this soil have been made more strongly acid by mine water. In reservoir areas, this soil is flooded for long periods, and it receives silt deposits from the floodwaters. Included in the mapped areas are small areas of nearly neutral Lindside soils (which are not mapped in this county), and some soils that are at higher elevations and are only occasionally flooded.

If cultivated crops are grown, the crops need to be rotated with hay in order to maintain the content of organic matter and to preserve the structure of the plow layer. A close-growing winter cover crop is needed to help protect the soil from the early spring floods. Winter grain and alfalfa are subject to heaving. Tile drains have been effective in drying up seeps and low spots, and diversions on or at the base of the adjacent slopes can remove the excess surface water. Pasture or perennial hay should be considered for the frequently flooded areas.

This soil is well suited to timber production and to development as a habitat for open-land wildlife. A seasonal high water table and flooding severely limit residential, light industrial, commercial, and institutional development. (Capability unit IIw-2; woodland group 2; community development group 15)

## Pope Series

This series consists of deep, well-drained, medium textured and moderately coarse textured soils that formed in sediment washed from the acid sandstone and shale uplands. These soils are mainly on the level flood plains along the larger streams in the county, where the permanent water table is more than 3 feet below the surface. Large areas are along the Conemaugh River, Blacklick Creek, Yellow Creek, and Crooked Creek. Although they are subject to occasional flooding, Pope soils are among the best in the county for agriculture.

The native vegetation consists mainly of second- and third-growth hardwoods, including oaks, maples, tulip-

poplar, and black cherry. White pine and hemlock are common in the eastern part of the county.

The plow layer of a typical moderately coarse textured Pope soil is a dark grayish-brown, very mellow fine sandy loam. It is underlain by a strong-brown, friable fine sandy loam that extends to a depth of about 40 inches. Below that is stratified sand, silt, and gravel.

Profile of Pope silt loam (0 to 5 percent slopes) in a pasture 2 miles south of Indiana:

Ap—0 to 12 inches, very dark grayish-brown (10YR 3/2) silt loam; weak, fine, granular structure; friable when moist; slightly acid (pH 6.4) where limed; abrupt, smooth boundary; 8 to 12 inches thick.

C1—12 to 28 inches, brown (7.5YR 4/4) silt loam; very weak, very fine, subangular blocky structure; friable when moist, slightly sticky and slightly plastic when wet; occasional organic pockets and many wormholes; strongly acid (pH 5.4); clear, wavy boundary; 10 to 18 inches thick.

C2—28 to 40 inches, brown (7.5YR 4/4) gravelly loam; massive breaking to very weak, very fine, subangular blocky structure; friable when moist, nonsticky and nonplastic when wet; strongly acid (pH 5.2); gradual, wavy boundary; 11 to 18 inches thick. (Gravel up to 6 inches in diameter makes up about 30 percent of this horizon.)

IIC—40 to 60 inches, stratified silt, sand, and gravel.

R—60 inches +, thick beds of sandstone.

In Indiana County, the common soil types in the Pope series are silt loam and fine sandy loam. Less common types are sandy loam and loamy sand. In many places, gravel of various sizes is scattered on the surface and throughout the solum.

The color of the C horizon ranges from brown (7.5YR 4/4) to yellowish brown (10YR 5/6); brown is most common. The texture of this horizon ranges from silt loam to gravelly sandy loam. The depth to the stratified material ranges from 3 to 4 feet, and the depth to hard shale or sandstone ranges from 4 to 12 feet.

On the broad flood plains, the Pope soils border the Philo soils and, in a few places, the Atkins soils. In some areas the Pope soils are below the Allegheny, Monongahela, Tygart, and Purdy soils, all of which are on old flood plains or terraces. In other areas the Pope soils are adjacent to the Ernest soils, which are on colluvial slopes, and to the Gilpin, Weikert, Dekalb, and Ramsey soils, all of which are on uplands.

The Pope soils are deeper to consolidated rock than the Weikert, Ramsey, and Dekalb soils. Their subsoil is not well developed, like that of the Allegheny and Gilpin soils; and it is not mottled, like that of the Philo, Atkins, Monongahela, Tygart, Purdy, and Ernest soils.

Pope soils are strongly acid or very strongly acid. They are moderate in natural fertility and have a moderate or moderately high water-holding capacity. They are easy to till and are well aerated.

**Pope fine sandy loam** (Pm).—This soil, for the most part, lies along streams and forms a natural levee. Included in the mapped areas are some moderately well drained Philo soils in local depressions and some soils on high bottom lands that are seldom flooded.

This soil is suitable for all of the locally grown crops. It is especially good for truck crops. Frequent but moderate applications of lime and fertilizer help to replace elements lost through leaching.

Timber production is an excellent use for this soil, and most areas can be made into a good habitat for open-land and woodland wildlife. Occasional flooding is a limitation for residential, light industrial, commercial, and institutional development. (Capability unit I–2; woodland group 1; community development group 15)

**Pope silt loam** (Po).—The profile of this soil is the one described as typical of the series. This soil has a greater capacity for holding water, lime, and fertilizer than Pope fine sandy loam.

This soil is suitable for all of the locally grown crops. It is especially good for truck crops and for timber. It can be developed as a habitat for both open-land and woodland wildlife. Occasional flooding is a limitation for residential, light industrial, commercial, and institutional development. (Capability unit I–2; woodland group 1; community development group 15)

## Purdy Series

The Purdy series consists of poorly drained or very poorly drained, medium-textured soils that formed in fine sediments deposited in flats or depressions on old stream terraces. These sediments apparently were deposited from standing water rather than flowing water, for they are designated as lacustrine. Purdy soils are extensive in the flats near Black Lick and Coral. Most areas either are pastured or are idle and commonly covered with swamp grass or thorn bushes. Wooded areas on some of the broad terraces that are intensively farmed generally are occupied by Purdy soils.

The native vegetation consists mainly of second-growth hardwoods, including red oak, black oak, shingle oak, elm, maple, beech, and sycamore.

The plow layer of a typical Purdy soil is a very dark grayish-brown, mellow silt loam. The subsoil is a gray silty clay loam that has many, distinct, yellowish-red, and strong-brown mottles. It is firm and brittle when moist and sticky and plastic when wet.

Profile of Purdy silt loam, 0 to 5 percent slopes, in a hayfield 2 miles west of Blairsville:

Ap—0 to 8 inches, very dark grayish-brown (2.5Y 3/2) heavy silt loam; few, fine, distinct mottles of strong brown (7.5YR 5/6); weak, fine, granular and subangular blocky structure; very weak platy structure at a depth of 7 or 8 inches; friable when moist, slightly sticky when wet; medium acid (pH 6.0); abrupt, smooth boundary; 6 to 9 inches thick.

B2—8 to 11 inches, grayish-brown (10YR 5/2) silty clay; many, medium, distinct, strong-brown (7.5YR 5/6) and yellowish-red (5YR 4/6) mottles; weak, medium, platy structure; friable when moist, plastic when wet; thin, discontinuous clay films; few black concretions; strongly acid (pH 5.2); clear, wavy boundary; 3 to 12 inches thick.

Bx—11 to 21 inches, gray (10YR 5/1) silty clay loam; many, medium, distinct, yellowish-red (5YR 4/6) and strong brown (7.5YR 5/8) mottles; moderate, coarse, prismatic structure breaking to moderate, medium, subangular blocky; firm when moist, sticky and plastic when wet; few black concretions; thick, continuous, gray (N 5/0) clay films; strongly acid (pH 5.4); gradual, wavy boundary; 8 to 13 inches thick.

B3g—21 to 30 inches, gray (10YR 5/1) silty clay; many, medium, distinct, yellowish-brown (10YR 5/6) mottles; moderate, medium or coarse, blocky structure; heavy, gray (N 5/0) clay films on peds; firm when moist, sticky and plastic when wet; common, fine, black concretions; strongly acid (pH 5.2); clear, wavy boundary; 8 to 15 inches thick.

Cg—30 inches +, gray (10YR 5/1) silty clay; massive.

The Ap horizon is commonly silt loam, but in some small areas it is silty clay loam. The B horizon is commonly silty clay and has some silty clay loam in the upper part. It ranges from gray (10YR 6/1) to grayish brown (10YR 5/2) in color and is distinctly mottled throughout. The depth to the massive silty clay ranges from 30 to 36 inches. The depth to hard shale or sandstone ranges from 6 to 20 feet.

In the depressions on the broad terraces, Purdy soils are commonly adjacent to the Tygart soils. In other places, they lie near the Monongahela, Ernest, and Brinkerton soils. Purdy soils are grayer and more distinctly mottled in the upper part of their subsoil than the Tygart, Monongahela, and Ernest soils; and they are more silty and clayey in the lower part than the Brinkerton soils.

Purdy soils are low in natural fertility and are strongly acid, except where limed. Their water-holding capacity is moderate, and their capacity to hold plant nutrients is good. Water stands on the surface much of the year because of the slowly permeable subsoil and parent material.

**Purdy silt loam, 0 to 5 percent slopes** (PuA).—This is the soil described as typical of the Purdy series. Small areas of Tygart soils; of somewhat poorly drained, coarser textured soils on terraces; and of very poorly drained, acid, lacustrine soils are included in the mapped areas. Some Atkins soils along streams on the terraces are also included.

Because of wetness, which is the major limitation, this soil is best suited to perennial hay or pasture seeded to grasses and legumes that tolerate wetness. Cultivated crops that tolerate wetness can be grown occasionally. Diversions and tile drains on the adjacent slopes help to reduce the amount of water that collects and stands on the surface. Open ditches also are helpful.

This soil is only fair for timber production. It is moderately well suited to development as a habitat for wetland wildlife. A high water table and slow permeability severely limit its suitability for residential, light industrial, commercial, and institutional development. (Capability unit IVw-1; woodland group 12; community development group 14)

## Ramsey Series

This series consists of well-drained, shallow or very shallow, moderately coarse textured soils that formed in acid, gray and brown sandstone. These soils occur mostly on steep and very steep ridges near Arcadia, Cherry Tree, and Lochvale.

The native vegetation consists mostly of second- and third-growth hardwoods. Chestnut oak, red maple, and black birch are common; and white pine, aspen, scarlet oak, black oak, white oak, and sassafras grow in some areas. Mountain-laurel, teaberry, groundpine, greenbrier, and various kinds of moss are common in the understory. Open, idle areas generally are covered with huckleberry and mountain-laurel.

A typical Ramsey soil has leaf litter and a mat of decomposed organic matter overlying a layer of very dark brown channery sandy loam. This layer gets lighter in color with depth. The subsoil is a yellowish-brown very channery sandy loam. Weathered sandstone is at a depth of about 15 inches; sandy loam fills the spaces between the fragments. Sandstone (bedrock) is at a depth of about 18 inches.

Profile of Ramsey channery sandy loam (5 to 12 percent slopes) in a woodlot about 3 miles southwest of Cookport:

O1—1½ inches to 1 inch, hardwood leaf litter.
O2—1 inch to 0, black (N 2/0), decomposed organic matter.
A1—0 to 3 inches, very dark brown (10YR 2/2) channery sandy loam; weak, very fine, granular structure; very friable when moist; very strongly acid (pH 4.8); abrupt, wavy boundary; 2 to 3 inches thick. (Sandstone fragments up to 10 inches in diameter make up about 40 percent of this horizon.)
A2—3 to 6 inches, dark-brown (10YR 4/3) channery sandy loam; weak, very fine, granular structure; very friable when moist; very strongly acid (pH 4.6); clear, wavy boundary; 2 to 4 inches thick. (Sandstone fragments up to 12 inches in diameter make up about 40 percent of this horizon.)
B2—6 to 15 inches, yellowish-brown (10YR 5/6) very channery sandy loam; very weak, very fine, subangular blocky structure; friable when moist, nonsticky and nonplastic when wet; very strongly acid (pH 4.8); clear, wavy boundary; 6 to 10 inches thick. (Sandstone fragments up to 8 inches in diameter make up about 70 percent of this horizon.)
C—15 to 18 inches, yellowish-brown sandy loam in voids between fragments of weathered, gray and brown sandstone.
R—18 inches +, hard, consolidated sandstone.

The A1 horizon is commonly channery sandy loam, but in many areas is very channery or very stony sandy loam. A discontinuous micropodzol horizon in the uppermost 2 to 6 inches is common. The B horizon ranges from brown (10YR 5/3) to yellowish brown (10 YR 5/8) in color and from channery loam to very stony sandy loam in texture. The coarse fragments increase in abundance with depth. They make up as much as 95 percent of the C horizon. The depth to consolidated sandstone ranges from 12 to 24 inches.

Ramsey soils are near the Weikert, Clymer, Cookport, and Gilpin soils. On the steeper valley slopes, they are intermixed with Dekalb soils. In some places they are above the Ernest and Brinkerton soils. Ramsey soils are similar to Dekalb soils but are shallower to hard rock. Unlike the Weikert, Clymer, and Gilpin soils, Ramsey soils have a subsoil that shows little or no increase in clay over the amount in the surface layer.

Ramsey soils are very strongly acid and are low in natural fertility. They are strongly leached and have a very low water-holding capacity.

**Ramsey and Dekalb channery sandy loams, 35 to 70 percent slopes** (RcE).—For both Ramsey channery sandy loam and Dekalb channery sandy loam, slope is the dominant feature affecting management. Separate mapping would have little practical significance, so these soils were mapped together as an undifferentiated group.

These soils are about 12 to 24 inches deep to hard rock. Their surface layer contains many fragments of sandstone. Rock escarpments are included in the mapped areas.

These soils are steep, shallow, droughty, and subject to severe erosion. Consequently, their best use is for watershed protection. They are only fair for timber, but woodland use should be considered because a good stand of trees helps to control erosion and thereby protects the watershed. These soils are poorly suited to development as a habitat for wildlife and are limited for residential,

commercial, light industrial, and institutional development. (Capability unit VIIe–1; woodland group 15; community development group 11)

**Ramsey and Dekalb very stony sandy loams, 35 to 100 percent slopes** (RdF).—The soils of this mapping unit are mostly in wooded areas. They are only 12 to 24 inches deep to hard sandstone. The sandstone crops out in some places.

These soils are fair for timber production. They are not suitable for development as a habitat for wildlife and are limited for residential, light industrial, commercial, and institutional development. (Capability unit VIIs–1; woodland group 15; community development group 11)

## Stony Land

Stony land consists of sloping areas in which 15 to 90 percent of the surface is stones and of steep areas that are mainly rock outcrops. Most of the areas are in the eastern part of the county where the geologic material is massive sandstone. One large area is southeast of Cramer on the ridges that border the Conemaugh River.

The native vegetation consists of mixed hardwoods, mainly red maple and chestnut oak.

**Stony land, sloping** (So).—This is a miscellaneous land type that ranges from a thin organic cover over sandstone to deep soil material over sandstone. It is not suitable for timber production, because of the many stones, but it is suitable for watershed protection, for wildlife, and for recreational use. (Capability unit VIIIs–1; community development group 16)

**Stony land, steep** (Sp).—This land type is difficult to manage because it is steep, stony, and shallow. Rock crops out throughout most of the area. Watershed protection or wildlife habitat are suitable uses. (Capability unit VIIIs–1; community development group 16)

## Strip Mine Spoil

This miscellaneous land type consists of areas that have been excavated to allow the removal of coal, limestone, sandstone, or fire clay. In strip mining, the procedure is first to remove the soil, next the weathered geologic material, and then the strata desired. In a typical area there is a high wall or vertical cliff, a spoil pile, and a cut or steep valley between the high wall and the spoil pile. The spoil pile is steep against the cut, level on the crest, and steep on the lower slope of the hill.

Most of the strip mine spoils in Indiana County are the result of coal-stripping operations. The coal strip mines are near Jacksonville, McIntyre, Lochvale, Glen Campbell, Smithport, Rossiter, Clymer, Dixonville, Marion Center, West Lebanon, Iselin, and along Blacklick Creek near Heshbon and Armagh. On some of the hills in the northeastern part of the county, three seams of coal are stripped on a single slope.

Coal strippings typically curve around the contour of the hill on a grade that follows the rise or fall of the coal seam. Both surface and underground water collects in the cut below the high wall. The water ordinarily is released by means of narrow drainageways through the spoil pile. In many places the concentrated flow of water has cut deep gullies across the areas below the spoil pile. Water that drains from these spoil piles is strongly acid and carries compounds that pollute the streams. The areas below the spoil piles generally are made strongly acid by the leaching water.

Revegetating Strip mine spoils is generally difficult because of acid soil material, erosion, the low water-holding capacity of the surface layer, and the high temperature of the surface layer in hot weather.

**Strip mine spoil, sloping** (Sr).—Large areas of this miscellaneous land type occur northwest of Jacksonville and Urey. Some of the areas have been leveled with earth-moving equipment. The surface layer of this land type consists mostly of yellowish-brown and olive-drab shale fragments of various sizes. Soft, gray, clay shale is at the surface in some places. It quickly weathers to a tight, slowly permeable surface layer. In other places the surface materials are sandstone, limestone and calcareous shale, carbonaceous shale and bony coal that generally are high in sulfur-bearing minerals, or a mixture of any or all of these materials.

This land type, for the most part, is best suited to woodland use because building up its physical and chemical condition for agricultural use is too costly. Small areas where limestone has been an influence, with the help of fertilizer, have been made productive of hay and pasture. Vegetation has been successfully established in areas that have sufficient soil material mixed with the raw shale. Planting or seeding the areas high in pyrites should be delayed until these acid-forming minerals have decomposed or leached out of the spoil. (Capability units IVs–1, VIIs–3, and VIIIs–1; community development group 16)

**Strip mine spoil, steep** (St).—This land type is more extensive than Strip mine spoil, sloping. Some of the spoil piles have been leveled to cover the exposed coal seam. Where the piles have not been leveled, the slopes are complex and the relief is rugged.

Much of this land type can be used as woodland. White pine and larch are suitable species to plant. On the steepest slopes and the high walls, however, any plants that will grow well and fast should be planted. Multiflora rose, autumn olive, high-bush cranberry, silky dogwood, crabapple, coralberry, crownvetch, and switchgrass, perhaps, are the most suitable plants for these areas. These plants can also provide food and cover for wildlife. (Capability units VIIs–3 and VIIIs–1; community development group 16)

## Tygart Series

This series consists of moderately well drained or somewhat poorly drained, medium-textured soils that formed in fine sediments deposited in flats or depressions on old stream terraces. These sediments apparently were deposited from standing water rather than flowing water, for they are designated as lacustrine. Tygart soils are extensive near Coral, Blairsville, and Shelocta.

The native vegetation consists of red oak, black oak, shingle oak, maple, elm, beech, hickory, ironwood, and sycamore.

The plow layer of a typical Tygart soil is a very dark grayish-brown, mellow silt loam. In the upper part of the subsoil, yellowish-brown fine silt loam overlies yellowish-brown silty clay loam that has many mottles of gray and strong brown. The lower part of the subsoil

is a gray silty clay loam that has many mottles of yellowish red and strong brown. It is firm and brittle when moist and sticky and plastic when wet.

Profile of Tygart silt loam, 0 to 3 percent slopes, in a cornfield 1½ miles west of Blairsville:

Ap—0 to 8 inches, very dark grayish-brown (10YR 3/2) silt loam; weak, medium, granular structure; friable when moist; neutral (pH 6.7) where limed; clear, smooth boundary; 7 to 10 inches thick.

B21—8 to 12 inches, yellowish-brown (10YR 5/4) heavy silt loam; weak, medium, subangular blocky structure; friable when moist, slightly sticky and slightly plastic when wet; patchy clay films; strongly acid (pH 5.1); clear, wavy boundary; 3 to 5 inches thick.

B22t—12 to 17 inches, yellowish-brown (10YR 5/4) silty clay loam; common, medium, distinct mottles of strong brown (7.5YR 5/6) and brown (10YR 5/3); moderate, medium, blocky structure; firm when moist, sticky and plastic when wet; thick, continuous clay films; strongly acid (pH 5.1); clear, wavy boundary; 4 to 10 inches thick.

B23t—17 to 24 inches, brown (10YR 5/3) silty clay loam; many, medium, distinct mottles of yellowish red (5YR 4/6) and strong brown (7.5YR 5/6); moderate, coarse prismatic structure that breaks to moderate, medium, blocky; firm when moist, sticky and plastic when wet; few black concretions; thick, discontinuous clay films; strongly acid (pH 5.3); gradual, wavy boundary; 6 to 18 inches thick.

B3g—24 to 56 inches +, gray (N 6/0) silty clay loam; many, medium, prominent mottles of yellowish red (5YR 4/6) and strong brown (7.5YR 5/6); moderate, coarse, prismatic structure breaking to moderate, coarse, blocky; firm when moist, sticky and plastic when wet; patchy clay films; many black concretions; strongly acid (pH 5.3). (Lower boundary not determined.)

The A horizon is commonly silt loam; in some small areas it is silty clay loam. The B horizon ranges from silty clay loam to silty clay; silty clay loam is more common. The upper part of the B horizon ranges from yellowish brown (10YR 5/4) to strong brown (7.5YR 5/8) in color; it is yellowish brown in most places. The lower part is gray (10YR 6/1 to N 6/0) in most places. This horizon is distinctly mottled below a depth of 12 inches and prominently mottled below a depth of 24 inches. The depth to massive clay or stratified silt and clay ranges from 4 to 6 feet, and the depth to hard shale or sandstone ranges from 6 to 20 feet.

On many of the broad terraces, Tygart soils are near the Monongahela soils; and in some places they are adjacent to the Ernest soils. Purdy soils lie within areas of the Tygart soils. Tygart soils are not so gray in the upper part of the subsoil as the Purdy soils; and they do not have the characteristic very firm, brittle fragipan of the Monongahela soils. Tygart soils have a more silty and clayey parent material than the Ernest soils, and they are grayer in the lower part of the subsoil.

Tygart soils are low in natural fertility and are strongly acid, except where limed. Their water-holding capacity is moderate, and their capacity to hold plant nutrients is good. Water stands on the surface during wet periods because of moderately slow permeability in the subsoil.

**Tygart silt loam, 0 to 3 percent slopes** (TrA).—This is the soil described as typical of the Tygart series. Small areas of moderately well drained or somewhat poorly drained Monongahela soils and of poorly drained or very poorly drained Purdy soils are included in the mapped areas. The Purdy soils are generally indicated on the map by a wet-spot symbol.

This soil is suitable for crops that tolerate wetness. Winter grain and alfalfa are subject to heaving. Because of the level and nearly level relief and moderately slow permeability, tiles or open ditches do not adequately drain this soil. Diversions that intercept water from the adjacent slopes, a bedding system, or tile drains that are backfilled with porous material help to reduce wetness.

This soil is well suited to timber production and is moderately well suited to development as a habitat for woodland and wetland wildlife. A high water table and moderately slow permeability severely limit residential, light industrial, commercial, and institutional development. (Capability unit IIIw–1; woodland group 11; community development group 14)

**Tygart silt loam, 3 to 8 percent slopes, moderately eroded** (TrB2).—This soil is better drained than the typical Tygart soil. It has lost much organic matter and consequently has a dark grayish-brown or dark yellowish-brown plow layer. Small areas of this soil that are slightly eroded or severely eroded are included in the mapped areas.

Erosion is a greater hazard on this soil than on Tygart silt loam, 0 to 3 percent slopes. Graded strips and a crop rotation in which hay is dominant are ways of reducing the hazard. Diversions on the long slopes also help; they intercept runoff.

This soil is well suited to timber production, and it is moderately well suited to development as a habitat for woodland wildlife. A high water table and moderately slow permeability severely limit residential, light industrial, commercial, and institutional development. (Capability unit IIIw–2; woodland group 11; community development group 14)

## Upshur Series

The Upshur series consists of moderately deep, well-drained, sticky, red soils that formed on uplands in red or reddish-brown, soft, calcareous clay shale. Because of the moderately fine texture of the surface layer and the slow permeability of the subsoil and parent material, these soils are the most erodible in the county. Slips or soil creep are common.

In Indiana County, Upshur soils occur as small, gently sloping to steep areas on ridgetops and benches. They are widely scattered in the western part of the county but are most common near Indiana and in the hills west of Homer City, south of Clarksburg (Lewisville), and east of Saltsburg.

The native vegetation consists of second-growth red oak, scarlet oak, black oak, white oak, black cherry, tulip-poplar, dogwood, and locust.

The plow layer of a typical Upshur soil is a dark reddish-brown silty clay loam. The upper part of the subsoil is a dark reddish-brown silty clay that is very sticky when wet. The lower part is a dusky-red clay that is very sticky and very plastic when wet.

Profile of Upshur silty clay loam, 3 to 8 percent slopes, moderately eroded, in a pasture 2 miles northeast of Indiana:

Ap—0 to 7 inches, dark reddish-brown (5YR 3/2) silty clay loam; moderate, fine, granular structure; friable

when moist, slightly sticky when wet; medium acid (pH 6.0); abrupt, smooth boundary; 6 to 9 inches thick.

B21t—7 to 14 inches, dark reddish-brown (2.5YR 3/4) silty clay; moderate, fine, blocky structure; firm when moist, sticky and plastic when wet; thick continuous clay films; medium acid (pH 6.0); clear, wavy boundary; 3 to 10 inches thick.

B22t—14 to 22 inches, dusky-red (10R 3/4) clay; strong, medium and fine, blocky structure; very firm when moist, very sticky and very plastic when wet; thick, continuous clay films; common, black concretions; medium acid (pH 5.6); clear, wavy boundary; 6 to 12 inches thick.

B3—22 to 30 inches, ducky-red (10R 3/4) clay; massive breaking to weak, fine, blocky structure; very firm when moist, very sticky and very plastic when wet; few discontinuous clay films; many, black concretions; medium acid (pH 5.8); gradual, wavy boundary; 4 to 12 inches thick.

C—30 to 46 inches, dark-red (10R 3/6) clay mixed with red and black, thinly bedded clay shale; massive; very firm when moist, sticky and plastic when wet; few clay patches; many, black concretions; neutral (pH 6.6); gradual, wavy boundary; 12 to 20 inches thick.

IIC—46 inches +, gray, calcareous clay shale.

The A horizon is commonly silty clay loam; it is silty clay in severely eroded areas. The B horizon ranges from silty clay loam to clay; it generally is finer textured with depth. It ranges from dark reddish brown (2.5YR 4/4) to dusty red (10R 3/4) in color but is most commonly weak red (10R 4/2, 4/3, or 4/4). The depth to the C horizon ranges from 24 to 40 inches. The material in this horizon ranges from massive, reddish-brown or dusky-red clay to soft, red clay shale. The depth to hard shale or sandstone ranges from 3 to 6 feet.

Upshur soils are commonly adjacent to Gilpin and Weikert soils and, less commonly, to Wharton, Cavode, and Vandergrift soils. Their subsoil is siltier and clayier than that of the Gilpin, Weikert, and Wharton soils; it is mottle-free, unlike the mottled subsoil of the Wharton, Cavode, and Vandergrift soils; and it is reddish in color, unlike the yellowish-brown subsoil of the Gilpin, Weikert, Cavode, and Wharton soils.

Water moves slowly through the subsoil and parent material of the Upshur soils, and consequently the plow layer is wet and sticky in spring. It is hard and cloddy when dry. Upshur soils tend to be somewhat droughty in dry weather because of the high content of clay in the subsoil. They are moderately high in natural fertility and respond well to lime and fertilizer. Their capacity for retaining plant nutrients is very good. When saturated with water, Upshur soils become unstable and have a tendency to slip or creep on moderate slopes.

**Upshur-Gilpin silty clay loams, 3 to 8 percent slopes, moderately eroded** (UgB2).—The soils that make up this mapping unit were mapped together as a complex because they occur in such an intricate pattern that separate mapping is not practical. The proportion of each soil in any area is extremely variable, but the Upshur soil generally is dominant.

These soils have lost much of their original surface layer through erosion. Their plow layer ranges from a reddish-brown silty clay loam to a dark grayish-brown silt loam and is difficult to till. In some places, small- and medium-sized fragments of shale or sandstone are on the surface. Small areas of these soils are slightly eroded, and other areas are severely eroded. Small areas of Cavode, Guernsey, and Wharton soils over gray clay shale are included in the mapped areas; they are generally indicated on the map by a wet-spot symbol.

To control erosion on these soils and to prevent compaction, cover crops should be rotated with hay crops. Alfalfa grows well on these soils. On the short slopes, contour farming and contour strips help to control erosion. On the long slopes, diversions and contour strips help to conserve moisture and to control erosion. Tile drains may be needed where there are wet spots.

These soils are well suited to timber production and to development as a habitat for open-land and woodland wildlife. Slow permeability and instability severely limit their suitability for residential, light industrial, commercial, or institutional development. (Capability unit IIIe-4; woodland group 6; community development group 7)

**Upshur-Gilpin silty clay loams, 8 to 15 percent slopes, moderately eroded** (UgC2).—Controlling erosion is a more serious problem on these soils than on Upshur-Gilpin silty clay loams, 3 to 8 percent slopes, moderately eroded. Small wooded areas of these soils are uneroded or are only slightly eroded.

These soils can be cultivated occasionally or can be used for hay or pasture. If adequately limed and fertilized, they are well suited to all the locally grown grasses and legumes. On long slopes, contour strips and diversions help to control erosion.

These soils are well suited to timber production and to development as a habitat for open-land and woodland wildlife. Slow permeability and instability severely limit residential, light industrial, commercial, or institutional development. (Capability unit IVe-2; woodland group 6; community development group 8)

**Upshur-Gilpin silty clay loams, 8 to 15 percent slopes, severely eroded** (UgC3).—The plow layer of these soils consists of reddish-brown or dark yellowish-brown former subsoil material. It is difficult to till. In places, shale or sandstone fragments and small round pieces of limestone make up as much as 50 percent of the plow layer. In other places, many gullies or rills have formed. Some of these gullies have eroded through the massive red clay down to hard shale or sandstone. The water-holding capacity has been seriously reduced.

The soils of this mapping unit are suitable for cultivated crops if 4 years or more of hay are grown in the rotation. They are also suitable for perennial hay or pasture. Diversions installed above the gullies and permanent sod established in the gullies and natural drainageways help to control erosion. Planting grasses and legumes in contour strips helps to conserve water and also to control erosion. Pastures should not be grazed when the surface layer is wet, to prevent compaction and damage to soil structure. Planting severely gullied areas to trees is often the most practical use.

These soils are fairly good for timber production, and they can be developed as a habitat for open-land and woodland wildlife. They are poorly suited to residential, light industrial, commercial, and institutional development. (Capability unit IVe-2; woodland group 6; community development group 8)

**Upshur-Gilpin silty clay loams, 15 to 25 percent slopes, moderately eroded** (UgD2).—These soils have lost much of their original surface layer through erosion. Their

plow layer ranges from a reddish-brown silty clay loam to a dark grayish-brown silt loam and generally is difficult to till. Hard shale or sandstone are at a depth of 24 to 36 inches. In some places shale, sandstone, and limestone fragments make up as much as 50 percent of the plow layer. Small wooded areas are uneroded or are only slightly eroded. Some narrow bands of Wharton and Cavode soils over gray clay shale are included in the mapped areas; they are generally indicated on the map by a wet-spot symbol.

These soils are suitable for pasture or hay crops. Alfalfa grows well if the soils are adequately limed and fertilized. Diversions on the gentle slopes above these soils help to reduce runoff and to control erosion. Contour strips and sodded waterways also are helpful. Tile drains are useful in wet spots.

These soils are fairly good for timber and can be developed as a habitat for woodland wildlife. Slopes, slow permeability, and instability severely limit their suitability for residential, commercial, light industrial, or institutional development. (Capability unit VIe–2; woodland group 6; community development group 8)

**Upshur-Gilpin silty clay loams, 15 to 25 percent slopes, severely eroded** (UgD3).—The plow layer of these soils consists mostly of organic matter stained former subsoil material that is mixed reddish and dark yellowish brown in color. Much of the acreage is overgrazed pasture or idle land. Many gullies or rills have formed. Many of these gullies have eroded through the massive red clay down to the harder shale, sandstone, or limestone. Shale chips and sandstone and limestone fragments make up 50 to 60 percent of the surface layer in places. In other places slips and small landslides are common.

These soils are better suited to pasture or trees than to row crops. In areas that can be renovated, drought-resistant grasses and legumes, such as orchardgrass and birdsfoot trefoil, grow well. In other areas, topdressing with lime and fertilizer encourages a productive bluegrass-clover pasture. Severely eroded and ledgy areas can be stabilized if planted to white pine or Austrian pine. Diversions installed above the head of gullies help to control further erosion. Renovating pastures in narrow strips across the slope also helps to control erosion.

These soils generally are fairly good for timber production and are well suited to development as a habitat for woodland wildlife. Slopes, slow permeability, and instability severely limit their suitability for residential, commercial, light industrial, or institutional development. (Capability unit VIe–2; woodland group 6; community development group 8)

**Upshur-Gilpin silty clay loams, 25 to 45 percent slopes, severely eroded** (UgE3).—The soils of this mapping unit are shallow or moderately deep and have a mixed reddish and yellowish-brown surface layer. In some places, shale chips or mixed shale and sandstone and limestone fragments make up 60 to 75 percent of the surface layer. In other places, slips and shale ledges are common. Slips and deep gullies are most common where the clayey Upshur soils are dominant. Small wooded areas of these soils are slightly eroded or moderately eroded.

These soils are suited to woodland and watershed protection. They are not deep enough for good timber but can be used for Christmas-tree production. They are well suited to development as a habitat for woodland wildlife. Multiflora rose, silky cornel, and autumn olive can be grown for wildlife food and cover. Slope, slow permeability, and instability severely limit the use of these soils for residential, light industrial, commercial, or institutional development. (Capability unit VIIe–2; woodland group 7; community development group 11)

## Vandergrift Series

The soils of this series are gently sloping or moderately and strongly sloping, medium textured, and moderately well drained or somewhat poorly drained. They formed in material that slid or washed from the adjacent uplands. The parent materials were derived from red and gray clay shale and siltstone, both of which are calcareous in places. Vandergrift soils are widely distributed in the southwestern part of the county, especially east of Saltsburg, north of Blairsville, and north of Indiana. They occupy the lower part of valley slopes.

The native vegetation consists of second-growth red oak, black oak, white oak, locust, walnut, black cherry, ash, and tulip-poplar.

The plow layer of a typical Vandergrift soil is a dark reddish-brown fine silt loam. It is underlain by a thin layer of dark reddish-brown silty clay loam that, in turn, is underlain by weak red silty clay. The lower part of the subsoil is a mottled gray and reddish-yellow clay. The subsoil is sticky and plastic when wet.

Profile of Vandergrift silt loam, 3 to 8 percent slopes, moderately eroded, in a cornfield 3 miles northwest of Blairsville:

Ap—0 to 7 inches, dark reddish-brown (5YR 3/2) heavy silt loam; weak, fine or medium, granular structure; friable when moist; neutral (pH 6.9) where limed; clear, smooth boundary; 6 to 10 inches thick.

B1—7 to 12 inches, dark reddish-brown (5YR 3/2) silty clay loam; moderate, fine or medium, blocky structure; firm when moist, slightly sticky and slightly plastic when wet; partial clay films on peds; neutral (pH 6.8); clear, smooth boundary; 3 to 6 inches thick.

B21t—12 to 24 inches, weak-red (10R 4/3) silty clay; many, medium, distinct mottles of reddish yellow (5YR 6/8) and gray (N 6/1) (with depth, mottles increase in abundance, size, and contrast.); moderate, medium, prismatic structure breaking to moderate, medium, blocky; heavy clay films on peds and prism faces; firm or very firm when moist, sticky and plastic when wet; few, fine, black concretions; medium acid (pH 5.7); gradual, wavy boundary; 8 to 15 inches thick.

B22tg—24 to 36 inches, weak-red (10R 4/2) clay; many, medium, distinct mottles of reddish yellow (5YR 6/8) and gray (N 6/1); moderate, medium, prismatic structure breaking to coarse, angular blocky; heavy clay films on peds and prism faces; very firm when moist, sticky and plastic when wet; few, fine, black concretions; neutral (pH 6.9); gradual, wavy boundary; 8 to 16 inches thick.

C—36 inches +, red clay shale that has black coatings; neutral (pH 7.1).

The B horizon ranges from dark reddish brown (5YR 3/2) to weak red (10R 4/2) in color and from silty clay loam to clay in texture. It is finer textured with depth. The depth to the massive reddish clay or reddish clay shale ranges from 30 to 42 inches, and the depth to hard shale or sandstone ranges from 4 to 12 feet.

Vandergrift soils range from neutral to strongly acid, depending on the amount of calcareous material in the substratum. They have a moderately high water-holding

capacity and are moderately high in natural fertility. Their capacity to hold and release plant nutrients is good. Water moves so slowly through the subsoil that the surface layer ordinarily is saturated in spring and late in fall.

**Vandergrift silt loam, 3 to 8 percent slopes, moderately eroded** (VaB2).—The profile of this soil is that described as typical of the Vandergrift series. This soil is well suited to crops that tolerate seasonal wetness. It is widely used for pasture because livestock have a good supply of water nearby. Some small wooded areas are not eroded. Other small areas are severely eroded and are dissected by many gullies.

This soil puddles easily if tilled or grazed when wet. Including hay or pasture in the rotation and growing a cover crop with or following the row crop are ways of maintaining the supply of organic matter and preserving good tilth. Diversion terraces at the base of the adjacent hillsides help to control runoff, and graded strips help to remove excess surface water. Tile drains can be used in seepage spots. Natural drainageways should remain in permanent sod.

This soil is well suited to timber production, and it can easily be developed as a habitat for open-land wildlife. A seasonal high water table and slow permeability limit residential, light industrial, commercial, and institutional development. (Capability unit IIe–4; woodland group 5; community development group 12)

**Vandergrift silt loam, 8 to 15 percent slopes, moderately eroded** (VaC2).—Most of this soil is pastured. Erosion and surface runoff present more serious problems on this soil than on the typical Vandergrift soil, and depth to hard shale or sandstone is less. Small wooded areas are uneroded or are only slightly eroded. Other small areas are severely eroded and difficult to till.

This soil is suited to use as cropland. A rotation that includes hay or pasture crops is needed to help maintain tilth and reduce erosion. Following a row crop with a cover crop also helps to protect the soil. Diversion terraces on or at the base of the adjacent upland slopes and graded strips help to remove excess surface water. Tile drains are effective in removing water from seep spots.

This soil is well suited to timber production. It is generally well suited to development as a habitat for open-land wildlife. A seasonal high water table, slow permeability, and slopes are limitations for residential, light industrial, commercial, and institutional development. (Capability unit IIIe–6; woodland group 5; community development group 12)

## Weikert Series

This series consist of shallow or very shallow, well-drained soils that formed in material weathered from acid shale, siltstone, and fine-grained sandstone. These soils are shaly throughout and have a low content of clay in their subsoil. They are generally shallower to bedrock than the associated Gilpin soils.

The native vegetation consist of second- and third-growth hardwoods, including red oak, scarlet oak, chestnut oak, white oak, red maple, dogwood, and sassafras.

The plow layer of a typical Weikert soil is a dark grayish-brown, very friable shaly silt loam. The subsoil is a yellowish-brown, friable very shaly silt loam. It is underlain by yellowish-brown shale. The shale fragments have silt loam coats. Hard, olive-brown shale is at a depth of about 24 inches.

Profile of Weikert shaly silt loam, 5 to 12 percent slopes, in a Christmas tree plantation 1 mile north of Commodore:

Ap—0 to 7 inches, dark grayish-brown (10YR 4/2) shaly silt loam; weak, fine and very fine, granular structure; friable or very friable when moist, slightly sticky when wet; strongly acid (pH 5.2); abrupt, smooth boundary; 6 to 8 inches thick. (Shale fragments up to 1 inch in diameter make up about 30 percent of this horizon.)

B2—7 to 13 inches, yellowish-brown (10YR 5/4) very shaly silt loam; moderate, fine and medium, subangular blocky structure modified by shale chips; friable when moist, slightly sticky and slightly plastic when wet; strongly acid (pH 5.2); clear, wavy boundary; 3 to 8 inches thick. (Fragments of olive (5Y 4/3) shale up to 4 inches in diameter make up about 50 percent of this horizon; brown (7YR 5/4) films are on shale surfaces.)

B3—13 to 18 inches, yellowish-brown (10YR 5/6) very shaly silt loam; strongly acid (pH 5.2); clear, wavy boundary; 2 to 5 inches thick. (About 80 percent of this horizon is shale fragments up to 5 inches in diameter.)

C—18 to 24 inches, olive (5Y 4/3) shale fragments; yellowish-brown (10YR 5/6) silt loam between voids and yellowish-brown (10YR 5/6) weathering rind on shale surfaces; some yellowish-red (5YR 5/6) and black coatings also on shale surfaces; strongly acid (pH 5.4); clear, wavy boundary; 4 to 8 inches thick. (The shale fragments make up 95 percent of this horizon.)

R—24 inches +, hard, olive-drab shale.

The Ap horizon is commonly shaly silt loam but is shaly loam in some small areas. In places it is very shaly. The color of the B horizon ranges from yellowish brown to brown in the 10YR hues. Some profiles do not have a B horizon. The depth to hard shale ranges from 12 to 24 inches.

**Weikert-Gilpin shaly silt loams, 5 to 12 percent slopes, severely eroded** (WgB3).—The soils that make up this mapping unit were mapped together as a complex because they occur in such an intricate pattern that separate mapping is not practical. The proportion of each soil in any area is variable, but the Weikert soil generally is dominant.

These soils have lost most of their original surface layer through erosion and, consequently, are shallower to hard shale than Gilpin-Weikert shaly silt loams, 5 to 12 percent slopes, moderately eroded. Their present plow layer is very shaly and is dark yellowish brown in color.

These soils are droughty in most years and, therefore, are not good for such crops as corn and potatoes. They are best suited to use as hayland. Orchardgrass and birdsfoot trefoil, or other drought-resistant grasses and legumes, grow best. Diversions and contour strips on the long slopes help to intercept runoff and to conserve water.

Generally, these soils are not suitable for commercial timber production or for development as a habitat for wildlife. Shallowness limits their suitability for residential, commercial, light industrial, and institutional development. (Capability unit IVe–3; woodland group 16; community development group 9)

**Weikert-Gilpin shaly silt loams, 12 to 20 percent slopes, severely eroded** (WgC3).—These soils have lost most of

their original surface layer through erosion. Their present surface layer is a mixture of shale and former subsoil material; it is dark yellowish brown in color. Hard shale is mainly at a depth of 12 to 18 inches, but in places it is near the surface. In some places there are many small gullies. These gullies remain small because of the shallowness to consolidated shale, which is not readily eroded.

Pasture seeded to drought-resistant grasses and legumes is the best use for the soils of this mapping unit. Frequent but moderate applications of lime and fertilizer not only help to keep the pasture productive but also help to replace elements lost through leaching.

These soils generally are not suitable for commercial timber production or for development as a habitat for wildlife. Shallowness limits their suitability for residential, commercial, light industrial, and institutional development. (Capability unit VIe–3; woodland group 16; community development group 10)

**Weikert and Gilpin shaly silt loams, 20 to 35 percent slopes, moderately eroded** (WkD2).—For both Weikert shaly silt loam and Gilpin shaly silt loam, slope is the dominant feature affecting management. Separate mapping would have little practical significance, so these soils were mapped together as an undifferentiated group.

The dark-brown plow layer of these soils is commonly 40 to 60 percent shale chips. The depth to hard shale ranges from 12 to 30 inches. Wooded areas are uneroded or are only slightly eroded.

Pasture seeded to drought-resistant grasses and legumes is the best use for the soils of this mapping unit. Topdressing with lime and fertilizer, rotating the grazing, and mowing help to keep the pasture productive for longer periods. Reseeding the pasture in strips across the slope helps to reduce erosion.

These soils generally are not suitable for commercial timber production or for development as a habitat for wildlife. Steepness and shallowness severely limit their suitability for residential, commercial, light industrial, and institutional development. (Capability unit VIe–3; woodland group 16; community development group 11)

**Weikert and Gilpin shaly silt loams, 20 to 35 percent slopes, severely eroded** (WkD3).—These soils have a plow layer that consists mostly of very shaly, dark yellowish-brown former subsoil. Hard shale is at a depth of 12 to 24 inches in most places, but it crops out in some places. Shallow gullies are common. Included in the mapped areas are some severely eroded Ernest and Allegheny soils and small areas of heavier, wetter Cavode soils on bands of clay shale. Most of the acreage is planted to Christmas trees or is covered with dewberry, povertygrass, sassafras, dogwood, sumac, and thornbushes.

The potential for commercial timber production is low because these soils are droughty, but Christmas trees can be grown. Wildlife and watershed protection are other uses. Steepness and shallowness severely limit residential, light industrial, commercial, and institutional development. (Capability unit VIIe–2; woodland group 16; community development group 11)

**Weikert and Gilpin shaly silt loams, 35 to 100 percent slopes, moderately eroded** (WkF2).—These soils are 12 to 24 inches deep to hard shale or sandstone. Shale chips commonly make up about 60 to 80 percent of the surface layer.

These soils can be used for watershed protection. They are too droughty for commercial timber production but are suitable for Christmas trees and for such timber products as fenceposts and pulpwood. They generally are not suitable for development as a habitat for wildlife or for residential, commercial, light industrial, or institutional development. (Capability unit VIIe–2; woodland group 17; community development group 11)

**Weikert and Gilpin shaly silt loams, 35 to 100 percent slopes, severely eroded** (WkF3).—These soils have lost most of their original surface layer through erosion. The present surface layer is mainly shale mixed with some organic matter stained material, formerly subsoil. Hard shale is at a depth of as much as 24 inches, but it crops out in places, generally on the upper part of the slope. Most of the acreage is idle or is in woodland pasture. Included in the mapped areas are narrow bands of somewhat poorly drained Cavode soils on very steep slopes, in steep drainageways, and above springheads. Also included are shallow soils on escarpmentlike terraces near the larger streams.

The soils of this mapping unit are not suitable for commercial timber production; they are suitable for Christmas trees and for such timber products as poles, posts, mine props, and pulpwood. Possibly they can be used for recreational purposes, but they are not suitable for residential, light industrial, commercial, and institutional development. (Capability unit VIIe–2; woodland group 17; community development group 11)

## Westmoreland Series

This series consists of moderately deep, well-drained, medium-textured soils on uplands. These soils formed in material that weathered from interbedded shale, sandstone, and limestone. They are some of the best grassland soils in the county; they are especially good for alfalfa. Most of the Westmoreland soils in Indiana County are on the rounded hills in the southwestern part near Elders Ridge, West Lebanon, and Nowrytown.

The native vegetation consists mainly of red oak, black oak, white oak, black cherry, locust, and elm. Walnut and ash grow in some places. Bluegrass is common in pastures.

The plow layer of a typical Westmoreland soil is a dark-brown, mellow silt loam. The subsoil is a yellowish-brown silty clay loam that is sticky and plastic when wet. Soft, thinly bedded, partially weathered shale is at a depth of about 24 inches. Hard shale is at a depth of about 40 inches.

Profile of Westmoreland silt loam, 5 to 12 percent slopes, moderately eroded, in an idle field a fourth of a mile south of West Lebanon:

Ap—0 to 8 inches, dark-brown (10YR 3/3) silt loam; weak, fine, granular structure; friable when moist; medium acid (pH 6.0); abrupt, wavy boundary; 7 to 9 inches thick.

B1—8 to 11 inches, yellowish-brown (10YR 5/6) heavy silt loam; weak, fine, subangular blocky structure; friable when moist, slightly sticky and slightly plastic when wet; thin, discontinuous clay films; slightly acid (pH 6.2); clear, wavy boundary; 2 to 6 inches thick.

B21t—11 to 16 inches, yellowish-brown (10YR 5/8) silty clay loam; moderate, fine, subangular blocky structure; friable when moist, sticky and plastic when

wet; thin, continuous clay films; medium acid (pH 5.6); clear, wavy boundary; 4 to 6 inches thick.

B22t—16 to 22 inches, yellowish-brown (10YR 5/6) silty clay loam; moderate, medium and fine, blocky structure; firm when moist, sticky and plastic when wet; thin, continuous clay films; medium acid (pH 5.6); gradual, wavy boundary; 5 to 8 inches thick.

B3—22 to 26 inches, yellowish-brown (10YR 5/8) silty clay loam; moderate, medium and fine, blocky structure; firm when moist, slightly sticky and slightly plastic when wet; thin, discontinuous clay films; medium acid (pH 5.6); clear, wavy boundary; 4 to 6 inches thick. (Fragments of soft, olive-drab shale make up 25 percent of this horizon.)

C—26 to 40 inches, soft, olive-drab shale; yellowish-brown (10YR 5/8) weathering rind; common, black concretions.

R—40 inches +, partly weathered, gray and brown shale.

The A horizon is commonly silt loam but is channery and shaly silt loam in some small areas. The B horizon ranges from yellowish brown (10YR 5/6) to strong brown (7.5YR 5/6) in color and from heavy silt loam to clay in texture. The depth to the C horizon ranges from 20 to 36 inches, and the depth to hard shale, sandstone, or limestone ranges from 24 to 48 inches.

Westmoreland soils do not have the mottled subsoil that is typical of the Guernsey and Clarksburg soils. They have a better developed, siltier, and clayier subsoil than the Gilpin and Weikert soils; and they are deeper than the Weikert soils.

Where they have not been limed, Westmoreland soils have a strongly acid surface layer, a medium acid subsoil, and medium acid or neutral parent material. They have a moderate water-holding capacity and are moderately permeable. They are moderate in natural fertility, and their capacity for holding and releasing plant nutrients is good.

**Westmoreland silt loam, 5 to 12 percent slopes, moderately eroded** (WmB2).—The profile of this soil is the one described as typical of the Westmoreland series. Included in the mapped areas are some slightly to severely eroded places, some slightly eroded or moderately eroded places on 0 to 5 percent slopes, and some clayey soils that have round, small and medium-sized fragments of limestone on the surface and throughout the solum.

This soil is well suited to all the locally grown farm crops, especially alfalfa. A rotation that includes hay crops is needed to help control erosion and to maintain tilth. Contour planting on the short slopes not only helps to control erosion but promotes water infiltration. Diversions and contour strips on the long slopes help to intercept runoff.

This soil is excellent for timber production, and it is well suited to development as a habitat for open-land and woodland wildlife. Shallowness is its main limitation for residential, commercial, light industrial, and institutional development. (Capability unit IIe–2; woodland group 9; community development group 3)

**Westmoreland silt loam, 12 to 20 percent slopes, moderately eroded** (WmC2).—This soil is generally shallower to hard shale, sandstone, or limestone than the typical Westmoreland soil. Its plow layer is clayier and contains more former subsoil material and fragments of shale, sandstone, or limestone. Erosion and runoff are greater hazards on this soil because of the stronger slopes. Included in the mapped areas are small bands of Guernsey silt loam, a soil that formed in calcareous clay shale.

This Westmoreland soil is good for crops and very good for hay. A 5-year rotation that includes at least 3 years of hay and not more than 1 year of row crops is needed for adequate erosion control. Diversions and contour strips are needed on the longer slopes. Natural waterways should remain in permanent sod.

This soil is excellent for timber production, and it is well suited to development as a habitat for wildlife. Moderately steep slopes and shallowness limit its suitability for residential, commercial, light industrial, and institutional development. (Capability unit IIIe–2; woodland group 9; community development group 4)

**Westmoreland silt loam, 20 to 35 percent slopes, severely eroded** (WmD3).—This soil is 24 to 36 inches deep to hard shale, sandstone, or limestone; it is shallower than the typical Westmoreland soil. Severe erosion has removed most of the original surface layer. The present surface layer is organic matter stained and brown, yellowish brown, or strong brown in color. It generally contains fragments of shale, sandstone, or limestone. Gullies and slips are common in some places. Included in the mapped areas are places that are moderately eroded or only slightly eroded and some wet Guernsey soils overlying clay shale. The Guernsey inclusions are indicated on the map by the conventional wet-spot symbol.

Because it is subject to severe erosion, this soil is better suited to hay or pasture than to row crops. If adequately limed and fertilized, it is good for alfalfa. Renovating in narrow strips across the slope helps to reduce erosion. Diversions help in some places. Where slopes are too steep for safe renovation and hay harvesting, topdressing with lime and fertilizer encourages the establishment of a productive bluegrass-clover pasture. Weed control and grazing control are means of increasing forage yields.

This soil is fair for timber production and moderate for development as a habitat for wildlife. Steepness and shallowness limit its suitability for residential, commercial, light industrial, and institutional development. (Capability unit VIe–1; woodland group 9; community development group 11)

## Wharton Series

This series consists of moderately well drained, medium-textured soils that formed in acid, gray and yellowish-brown clay shale and, to a lesser extent, siltstone. These soils are mostly on nearly level or gently sloping, broad hilltops and benches. They are scattered throughout the county but occupy extensive areas near Johnsonburg, Trade City, Penn Run, Mechanicsburg, Indiana, and Lewisburg. The Wharton soils make up most of the important farm areas in the county.

The native vegetation consists of second- and third-growth hardwoods, including red oak, black oak, scarlet oak, white oak, red maple, black cherry, tulip-poplar, and ash. Basswood, elm, cucumber, hickory, and sassafras grow in some areas. Hemlock and white pine are common in the eastern part of the county.

The plow layer of a typical Wharton soil is a dark grayish-brown, friable silt loam. The upper part of the subsoil is a strong-brown silty clay loam that is sticky and plastic when wet. The lower part is a dark grayish-brown silty clay loam that has many olive-gray and brown mottles. The typical Wharton soil is underlain

by beds of partially weathered, acid, gray clay shale.

Profile of Wharton silt loam, 0 to 3 percent slopes, in a hayfield in North Mahoning Township, half a mile southeast of Marchand (This is profile S61Pa32-57 (1-5), for which physical and chemical data are given in tables 11 and 12, pages 94 and 98.):

Ap—0 to 10 inches, dark grayish-brown (10YR 4/2) silt loam; weak, fine and medium, granular structure; friable when moist, slightly sticky and slightly plastic when wet; medium acid (pH 5.9) where limed; abrupt, smooth boundary; 8 to 12 inches thick.

B21t—10 to 15 inches, strong-brown (7.5YR 5/6) silty clay loam; moderate, fine, subangular blocky structure; firm when moist, sticky and plastic when wet; thin continuous clay films; very strongly acid (pH 4.8); gradual, wavy boundary; 5 to 17 inches thick.

B22t—15 to 25 inches, strong-brown (7.5YR 5/6) heavy silty clay loam; moderate, fine and medium, subangular blocky structure; firm when moist, slightly sticky and slightly plastic when wet; thin, continuous clay films and thick, patchy clay films; very strongly acid (pH 4.7); clear, irregular boundary; 4 to 15 inches thick.

B23tg—25 to 37 inches, dark grayish-brown (2.5Y 4/2) silty clay loam; many, fine to coarse, distinct, light olive-gray (5Y 6/2) and brown (10YR 5/3) mottles; moderate, coarse, prismatic structure (polygons); firm or very firm when moist, slightly sticky and slightly plastic when wet; thick clay deposits in cracks and voids and on ped faces; very strongly acid (pH 4.6); gradual, irregular boundary; 4 to 15 inches thick.

C—37 to 50 inches +, dark grayish-brown (2.5Y 4/2) silty clay loam; many, fine, distinct, light olive-gray (5Y 6/2) and dark olive-gray (5Y 3/2) mottles; largely structureless, but some very coarse polygons; firm or very firm when moist, slightly sticky and slightly plastic when wet; very strongly acid (pH 4.5). (Fragments of weathered shale mostly less than a quarter of an inch in diameter make up about 80 percent of this horizon; black coatings and streaks are common on the fragments.)

The B horizon ranges from silt loam to clay and generally is finer textured with depth. The color in the upper part of the B horizon ranges from yellowish brown (10YR 5/6) to brown (7.5YR 5/4); yellowish brown in 10YR hues is most common. The color in the lower part ranges from light brownish gray (2.5Y 6/2) to light yellowish brown (10YR 6/4). This part of the B horizon is distinctly mottled, as is the C horizon. The material in the C horizon ranges from a very firm, somewhat massive silty clay loam or silty clay to a soft, weathered, gray clay shale of platy structure. The depth to the C horizon ranges from 32 to 50 inches, and the depth to hard shale or sandstone ranges from 36 to 72 inches. Many small and medium-sized fragments of stone are scattered on the surface and throughout the solum in some places.

Wharton soils are near the Cavode, Gilpin, and Weikert soils; and they adjoin the Ernest, Brinkerton, Cookport, Clymer, Dekalb, and Upshur soils. Wharton soils are not so gray or so mottled in the upper part of the subsoil as the Cavode and Brinkerton soils. They have a siltier and clayier subsoil than the Gilpin, Weikert, Cookport, Clymer, and Dekalb soils, but not the Upshur soils. They differ further from the Upshur soils in that they do not have a reddish subsoil.

Wharton soils have a moderate or moderately high water-holding capacity and are moderately permeable. They are low in natural fertility, but their capacity for storing and releasing plant nutrients is good. They are not well suited to deep-rooted plants because of somewhat poor aeration and internal drainage in the lower part of the subsoil and the parent material. They are easily eroded.

**Wharton silt loam, 0 to 3 percent slopes** (WrA).—This is the soil described as typical of the Wharton series. Included in the mapped areas are some moderately eroded places; some Cavode soils; and some deep, well-drained soils.

This soil is well suited to most of the crops grown in the county. Alfalfa and winter grain may be damaged by heaving, especially in undrained low spots. In most years, however, alfalfa grows well if adequate amounts of lime and fertilizer are applied. Tile drains help to improve internal drainage. A rotation that includes hay crops is needed to maintain tilth.

This soil is well suited to timber production and to development as a habitat for open-land wildlife. A seasonal high water table and slow permeability limit its suitability for residential, commercial, light industrial, and institutional development. (Capability unit IIw-1; woodland group 8; community development group 12)

**Wharton silt loam, 3 to 8 percent slopes, moderately eroded** (WrB2).—This soil is more extensive than Wharton silt loam, 0 to 3 percent slopes. Surface drainage is better, but runoff is more rapid. Except in wooded areas, the surface layer of this soil is less mellow and lighter colored than that of the typical Wharton soil. In areas surrounding natural drainageways, the surface layer is even less mellow and lighter colored. In these areas, rills and small gullies carry surface water and seepage from adjacent areas into the drainageways. Early in spring and late in fall, water from the seeps collects in the low spots and stands on the surface. Some deep, well-drained soils are included in the mapped areas.

This soil is good for crops, but a rotation that includes at least 2 years of hay not only helps to control erosion but also improves tilth. Diversions and graded strips help in removing excess surface water on the long slopes. Tiles can be used to drain low spots and seeps.

Timber production is an excellent use for this soil, and plants that provide food and cover for rabbits, pheasants, and other open-land wildlife can be grown economically and in large quantities. Residential, commercial, light industrial, and institutional development is limited by the seasonal high water table and slow permeability. (Capability unit IIe-5; woodland group 8; community development group 12)

**Wharton silt loam, 8 to 15 percent slopes, moderately eroded** (WrC2).—This soil has a lighter colored plow layer than the typical Wharton soil. Shale or sandstone fragments are more abundant, either because it is on short slopes below the Gilpin, Weikert, or Dekalb soils or because it formed in gray clay shale interbedded with shale or sandstone. The depth to hard shale or sandstone ranges from 36 to 54 inches. Wooded areas are uneroded or are only slightly eroded.

Cultivated crops can be grown if followed by 3 or 4 years of hay. Diversions and narrow-width strips are needed on the long slopes to help control erosion. Tiles can be used to drain seeps.

This soil is well suited to timber production and is well suited to development as a habitat for open-land wildlife.

Seeps, slow permeability, and slopes limit its suitability for residential, commercial, light industrial, and institutional development. (Capability unit IIIe–7; woodland group 8; community development group 13)

**Wharton silt loam, 8 to 15 percent slopes, severely eroded** (WrC3).—This soil has an organic matter stained, strong-brown or yellowish-brown plow layer that is hard and cloddy when dry and slightly sticky when wet. Numerous gullies and rills are common. The water-holding capacity of this soil is lower than that of the typical Wharton soil.

Cultivated crops can be grown on this soil only occasionally, and they need to be followed by 3 or 4 years of hay. Birdsfoot trefoil is better than alfalfa for perennial hay. Diversions at the head of gullies intercept runoff and thereby help in establishing permanent sod in the gullies. Tiles can be used to drain wet-weather springs that keep some of the gullies active. In reseeding pasture or hayland, alternate strips planted across the slope help to reduce erosion.

This soil is well suited to timber production and is moderately well suited to development as a habitat for woodland wildlife. Slopes, seeps, and slow permeability limit its suitability for residential, commercial, light industrial, and institutional development. (Capability unit IVe–5; woodland group 8; community development group 13)

**Wharton silt loam, 15 to 25 percent slopes, moderately eroded** (WrD2).—This soil is mainly on short slopes. It is 36 to 42 inches deep to hard shale or sandstone. In most places, shale chips or small and medium-sized fragments of sandstone are on the surface and throughout the solum. Small wooded areas are uneroded or are only slightly eroded.

This soil is well suited to hay crops. Occasionally, it can be used for cultivated crops. Diversions and strip farming help to control runoff and erosion. Tile drains are useful in seeps.

This soil is well suited to timber production and is moderately well suited to development as a habitat for woodland wildlife. Moderately steep slopes, seeps, and slow permeability, however, severely limit its suitability for residential, commercial, light industrial, and institutional development. (Capability unit IVe–5; woodland group 8; community development group 13)

# *Formation and Classification of the Soils*

In this section, the factors of soil formation and their relation to the soils in Indiana County are discussed and the classification of the soils is described.

## Factors of Soil Formation

The major factors of soil formation are climate, parent material, relief, plants and animals, and time. The kind of soil that forms in any given place depends on the interaction of these factors.

*Climate*, through the effects of precipitation, temperature, and wind, affects the soil formation by influencing chemical reactions and the rate of weathering. Precipitation and temperature, moreover, influence plant growth and microbiological activity. The soils in Indiana County likely formed in a humid, temperate climate, for they are deeply weathered and highly leached.

*Parent material* influences the textural, chemical, and mineralogical properties of soils. In Indiana County, most of the soils developed in residuum derived from folded, interbedded sedimentary rocks, namely, sandstone, siltstone and clay shale, and limestone and coal. The close interbedding of the sedimentary rocks and the impurity of the rocks, in addition to geologic erosion, make it difficult to trace a specific soil to a specific parent material. Only in some soils do the characteristics indicate the dominance of a certain parent material. For example, the reddish, fine-textured Upshur soils on benches between brownish, coarser textured soils likely developed in material derived from red clay shale.

*Relief* affects both surface drainage and internal drainage. Surface drainage determines the degree of geologic erosion; and erosion, in turn, determines soil depth. Internal drainage affects weathering of the soil material and of the bedrock. Steep soils commonly are shallow, because of rapid runoff, and have deep soils at their base. The steep Weikert soils, for example, lose soil material almost as fast as it forms; and the deep Ernest and Clarksburg soils have formed in colluvium at the base of steep soils. Level soils generally are deep and collect water from adjacent slopes. The level Brinkerton soils, for example, collect runoff and are subject to seepage.

*Plants and animals* that live on and in the soil are active in the soil-forming process. They furnish organic matter to the soil and affect physical and chemical changes in the soil. During much of the period in which the soils were forming, the native vegetation in the county was mostly deciduous trees but included some conifers. The Clarksburg, Gilpin, Allegheny, Cavode, Cookport, and some other major soils in the county developed under such vegetation. In undisturbed areas, these soils have a leached A2 horizon, which is a characteristic of soils that formed under forest cover.

*Time* is required for soils to form. How much time depends on the other factors of soil formation. Most of the soils in Indiana County are mature, that is, they have clearly defined horizons, or layers. The Pope soils, however, and other soils that formed in recent alluvium, have little horizon development because they have been exposed to rainfall, temperature, plants, and microorganisms for only a short time.

## Classification of the Soils

Two systems of soil classification are now in general use throughout the United States. The older of the two was developed in 1938 (*16*) and was revised in 1949 (*13*). It consists of six categories—the order, the suborder, the great soil group, the family, the series, and the type. Only the great soil groups represented in the county are discussed in this section. The series and the type are explained in the section "How This Soil Survey Was Made."

The newer system of classification was adopted in 1965 and is called A Comprehensive System of Soil Classification. It too consists of six categories—the order, the suborder, the great group, the subgroup, the family, and the series. In table 9 the soil series of Indiana County are

TABLE 9.—*Soil series classified according to 1938 and current systems of soil classification*

| Soil series | 1938 classification | Current classification [1] |
|---|---|---|
| | *Great soil group* | *Subgroup* |
| Allegheny | Gray-Brown Podzolic (intergrading to Red-Yellow Podzolic) | Alfic Normudults. |
| Armagh | Low-Humic Gley | Typic Ochraquults. |
| Atkins | Low-Humic Gley | Fluventic Normaquepts. |
| Brinkerton | Low-Humic Gley | Typic Fragiaqualfs. |
| Cavode | Gray-Brown Podzolic (intergrading to Red-Yellow Podzolic) | Aqualfic Normudults. |
| Clarksburg | Gray-Brown Podzolic | Aquic Fragiudalfs. |
| Clymer | Gray-Brown Podzolic (intergrading to Red-Yellow Podzolic) | Typic Normudults. |
| Cookport | Gray-Brown Podzolic (intergrading to Red-Yellow Podzolic) | Aquic Fragiudults. |
| Dekalb | Sol Brun Acide | Typic Dystrochrepts. |
| Ernest | Gray-Brown Podzolic (intergrading to Red-Yellow Podzolic) | Aquic Fragiudults. |
| Gilpin | Gray-Brown Podzolic (intergrading to Red-Yellow Podzolic) | Alfic Normudults. |
| Guernsey | Gray-Brown Podzolic | Aquic Normudalfs. |
| Monongahela | Gray-Brown Podzolic (intergrading to Red-Yellow Podzolic) | Aquic Fragiudults. |
| Nolo | Low-Humic Gley | Aquic Fragiudults. |
| Philo | Alluvial | Aquic Udifluvents. |
| Pope | Alluvial | Typic Udifluvents. |
| Purdy | Low-Humic Gley | Typic Fragiaquults. |
| Ramsey | Lithosol | Lithic Dystrochrepts. |
| Tygart | Red-Yellow Podzolic (intergrading to Low-Humic Gley) | Aquic Normudults. |
| Upshur | Gray-Brown Podzolic | Typic Normudalfs. |
| Vandergrift | Gray-Brown Podzolic | Aquic Normudalfs. |
| Weikert | Lithosol | Lithic Dystrochrepts. |
| Westmoreland | Gray-Brown Podzolic (intergrading to Red-Yellow Podzolic) | Alfic Normudults. |
| Wharton | Gray-Brown Podzolic (intergrading to Red-Yellow Podzolic) | Paraquic Normudults. |

[1] Some soil series may be reclassified as a result of further study.

placed in categories of both the 1938 and current systems of classification.

### Great soil groups

In the following pages, the great soil groups represented in Indiana County are described and the soil series in each group are named. Soils that have internal characteristics in common have been placed in the same great soil group.

#### GRAY-BROWN PODZOLIC

Soils of the Gray-Brown Podzolic great soil group formed under a deciduous forest in a humid, temperate climate. In an area that has not been disturbed, a typical soil of this group has leaf litter on the surface. Below the litter is a thin layer of humus, and below the humus is a dark-colored surface layer (A1 horizon), a leached grayish-brown layer (A2 horizon), and a brown, yellowish-brown, or strong-brown subsoil (B horizon) that is clayier than the surface layer and the parent material. The subsoil has moderate or strong, blocky structure. The parent material is generally calcareous. Gray-Brown Podzolic soils have retained a moderate amount of exchangeable bases; the amount increases with depth.

In this county the soils of the Clarksburg, Guernsey, Upshur, and Vandergrift series are considered Gray-Brown Podzolic soils. These soils have lime-influenced parent material. Upshur and Vandergrift soils have a redder subsoil than is typical of this group. The reddish color is not a result of weathering; rather it reflects the parent material, which is red clay shale.

Soils of the Allegheny, Cavode, Clymer, Cookport, Ernest, Gilpin, Monongahela, Westmoreland, and Wharton series have features that are characteristic of both the Gray-Brown Podzolic and the Red-Yellow Podzolic great soil groups. These soils have the colors and the horizon sequence that are characteristic of Gray-Brown Podzolic soils. Because of lime-influenced parent material, the Westmoreland soils are less acid and have higher base saturation than the other intergrades. They, therefore, are closer to being Gray-Brown Podzolic soils than Red-Yellow Podzolic soils. The strongly leached Allegheny, Cookport, and Monongahela soils, on the other hand, come closer to being Red-Yellow Podzolic soils. The Cavode, Cookport, Ernest, Monongahela, and Wharton soils have a slowly permeable layer that impedes drainage and hinders root development.

#### LOW-HUMIC GLEY

Soils of this great soil group have a thin surface horizon, moderately high in organic-matter content, over a mottled or partially gleyed mineral subsoil. These soils formed under swamp forest. They have a fluctuating, seasonally high water table. The Armagh, Atkins, Brinkerton, Nolo, and Purdy soils are representative of the Low-Humic Gley group in Indiana County.

#### RED-YELLOW PODZOLIC

No soils in Indiana County are considered representative Red-Yellow Podzolic soils. The soils of the Tygart series have many characteristics that are typical of Red-Yellow Podzolic soils: they are strongly leached, are strongly acid, and have low base saturation. But they also have characteristics that are typical of Low-Humic Gley soils: they have a surface horizon that is moderately high in organic-matter content, a strongly mottled subsoil, and a fluctuating high water table. Tygart soils, therefore, are Red-Yellow Podzolic soils that intergrade to Low-Humic Gley soils.

#### SOL BRUN ACIDE

Soils of this great soil group formed under deciduous forest in a humid, temperate climate. They are strongly

Table 10.—*Soil catenas in Indiana County*

| Topographic position and parent material | Well drained: Shallow | Well drained: Moderately deep | Well drained: Deep | Moderately well drained | Somewhat poorly drained | Poorly drained | Very poorly drained |
|---|---|---|---|---|---|---|---|
| Upland areas: | | | | | | | |
| Acid gray shale, siltstone, and fine-grained sandstone. | Weikert | Gilpin | | | | | |
| Acid gray sandstone; some siltstone and shale. | Ramsey | Dekalb | Clymer | Cookport [1] | | Nolo | |
| Acid gray clay shale; some siltstone. | | | | Wharton | Cavode | Armagh | |
| Interbedded shale, siltstone, sandstone, and limestone. | | Westmoreland | | Guernsey [1] | | | |
| Red, calcareous clay shale | | Upshur | | | | | |
| Colluvial-alluvial lower slopes: | | | | | | | |
| Acid shale, siltstone, and sandstone. | | | | Ernest [1] | | Brinkerton [2] | |
| Shale, siltstone, sandstone, and limestone. | | | | Clarksburg [1] | | | |
| Red and gray clay shale and siltstone. | | | | Vandergrift [1] | | | |
| Old alluvial terraces: | | | | | | | |
| Silt, clay, and fine sand; some gravel. | | | Allegheny | Monongahela [1] | | | |
| Silt and clay deposited in still water. | | | | Tygart [1] | | Purdy [2] | |
| Flood plains: | | | | | | | |
| Alluvium of acid sandstone and shale origin. | | | Pope | Philo [1] | | Atkins | |

[1] Dominantly moderately well drained, but somewhat poorly drained in places.
[2] Dominantly poorly drained but very poorly drained in places.

leached and are acid. There is little contrast in color between the A horizon and the B horizon. The B horizon has weak structure and shows little evidence, or only traces, of clay accumulation. Sols Bruns Acides in Indiana County are the soils of the Dekalb series.

#### ALLUVIAL

This great soil group consists of soils that formed in stratified sediments recently deposited by streams. These soils have little or no profile development and are considered youthful in all respects. Soils of the Philo and Pope series represent this great soil group in Indiana County.

#### LITHOSOL

Soils of this great soil group formed in materials that are shallow to bedrock. The shallowness is attributed either to geologic or accelerated erosion or to parent material that was resistant to weathering, or to both.

In Indiana County, the Ramsey and Weikert soils are classified as Lithosols. These soils are shallow to sandstone, siltstone, or consolidated shale. The Ramsey soils have a B horizon of weak structure. The Weikert soils have a B horizon of moderate structure, but in places the B horizon consists mostly of shale fragments.

### Soil catenas

A catena consists of a group of soils that formed in similar parent material but have unlike characteristics because of differences in relief and drainage. It is a grouping of soils that are closely associated on the landscape. Table 10 shows the soil series in Indiana County grouped into catenas. Each series is shown in its major drainage class, but some series overlap to another class. Cookport soils, for example, are dominantly moderately well drained but in places are somewhat poorly drained.

## Laboratory Data

In Indiana County, soils of the Atkins, Brinkerton, Cavode, Clymer, Ernest, Gilpin, and Wharton series were selected for laboratory analyses. Samples for each of these soil series, except the Atkins, were taken at two sites. Four 1-quart samples were collected from each horizon at each site. For the Atkins series, samples were taken at only one location.

The analyses were made by the Soil Characterization Laboratory of the Pennsylvania State University. Tables 11 and 12 show physical, chemical, and mineralogical data resulting from the analyses, and following are descriptions of profiles that were analyzed.

*Atkins silt loam* (0 to 5 percent slopes). Profile in an idle field three-fourths of a mile northwest of Marion Center. This is profile S58Pa32-4 (1-2), for which physical and chemical data are given in tables 11 and 12.

Ap—0 to 8 inches, dark-brown (10YR 3/3) silt loam; common, fine and medium, faint, dark grayish-brown

(10YR 4/2) mottles; weak, fine, subangular blocky structure (very weak platy structure near the surface); friable when moist, nonsticky when wet; strongly acid (pH 5.4); clear, wavy boundary; 8 to 9 inches thick.

B1g—8 to 16 inches, olive-gray (5Y 4/2) silt loam; common, fine and medium, prominent, yellowish-red (5YR 4/6) and strong-brown (7.5YR 5/6) mottles; weak, fine and medium, subangular blocky structure; friable when moist, slightly plastic when wet; clay coatings on peds and in root channels; strongly acid (pH 5.4); abrupt, wavy boundary; 6 to 9 inches thick.

IIC—16 inches +, stratified, dark grayish-brown (2.5Y 4/2) silt and fine sand; common, medium, distinct, gray (5Y 5/1) and brown (7.5YR 4/4) mottles; weak, medium, platy structure.

*Brinkerton silt loam* (3 to 8 percent slopes). Profile in a pasture in East Mahoning Township, 1 mile west of Marion Center. This is profile S58Pa32-3 (1-6), for which physical and chemical data are given in tables 11 and 12; profile S61Pa32-50 (1-7), also of Brinkerton silt loam, is described in the section "Descriptions of the Soils."

Ap—0 to 8 inches, dark grayish-brown (2.5Y 4/2) silt loam; weak, fine, granular structure and weak, thin platy structure; friable; few peds of unaltered subsoil in the 2- to 8-inch depth range; few, brown concretions; neutral (pH 6.6); abrupt, smooth boundary; 7 to 12 inches thick.

B1tg—8 to 14 inches, grayish-brown (2.5Y 5/2) silty clay loam; common, fine, distinct, gray (N 6/0) streaks and common, fine and medium, prominent, strong-brown (7.5YR 5/6) mottles; moderate, medium, blocky structure; firm when moist, sticky and plastic when wet; medium, thick, continuous clay films; few, small concretions; very strongly acid (pH 4.8); gradual, wavy boundary; 4 to 9 inches thick.

B21tg—14 to 21 inches, grayish-brown (2.5Y 5/2) silty clay loam; many, fine and medium, distinct, gray (N 6/0) mottles and streaks; moderate, fine and medium, blocky structure; firm when moist, plastic when wet; thick films of clay and silt; few, small, brown concretions; very strongly acid (pH 5.0); gradual, wavy boundary; 5 to 10 inches thick.

Bx1g—21 to 29 inches, grayish-brown (2.5Y 5/2) silt loam; many, fine, distinct, gray (N 6/0) streaks and mottles and many, fine and medium, prominent, strong-brown (7.5YR 5/6) mottles; weak polygons breaking to moderate, medium, platy or blocky structure; firm or very firm in place; sticky and plastic when wet; many, continuous, gray (10YR 6/1) clay films; few, reddish-brown (2.5YR 4/4) or black clay films; some reddish-brown concretions; very strongly acid (pH 5.0); clear, wavy boundary; 6 to 12 inches thick.

Bx2g—29 to 34 inches, gray (5Y 5/1) silt loam; many, faint, light-gray (10YR 6/1) mottles and many, fine and medium, prominent, yellowish-red (5YR 4/8) mottles and streaks; polygons breaking to moderate, medium, blocky structure (very weak platy structure near bottom); firm in place; sticky and plastic when wet; moderately thick clay films; few, small fragments of very dark gray shale and many, brown and reddish-brown concretions up to 4 millimeters in diameter; medium acid (pH 5.6); clear, wavy boundary; 3 to 7 inches thick.

Bx3g—34 to 40 inches, gray (5Y 5/1) silt loam; common, fine, faint, light-gray (N 6/0) mottles and streaks and common, fine, prominent, strong-brown (7.5YR 5/6) mottles; polygons breaking to weak, blocky structure and moderate, medium, platy structure; firm when moist, plastic when wet; patchy clay films on peds; many reddish-brown concretions; medium acid (pH 6.0). (Similar material continues to greater depth; structure is less distinct with depth.)

*Cavode silt loam* (0 to 3 percent slopes). Profile in a wooded area in East Mahoning Township, 1 mile west of Marion Center. This is profile S58Pa32-2 (1-9), for which physical and chemical data are given in tables 11 and 12; profile S61Pa32-59 (1-6), also of Cavode silt loam, is described in the section "Descriptions of the Soils."

O1—1½ inches to 1 inch, hardwood leaf litter, 0 to 3 inches thick.

O2—1 inch to 0, black (N 2/0), granular leaf mold mixed with mineral material by worms and other organisms; very few, dark-gray concretions; very strongly acid (pH 4.8); abrupt, wavy boundary; ½ inch to 2 inches thick.

A1—0 to 4 inches, dark-brown (7.5YR 3/2) silt loam; weak, fine, granular structure; very friable when wet; few reddish-brown concretions; very strongly acid (pH 4.8); clear, wavy boundary; 2 to 5 inches thick.

A2—4 to 6 inches, yellowish-brown (10YR 5/4) silt loam; weak, medium, granular structure and weak, thin, platy structure; friable when moist, slightly plastic when wet; few hard concretions; very strongly acid (pH 4.6); clear, wavy boundary; 1 to 5 inches thick.

B1—6 to 9 inches, yellowish-brown (10YR 5/6) silty clay loam; moderate, medium and fine, subangular blocky structure and very fine, blocky structure; friable when moist, slightly plastic when wet; thin clay films; many brown concretions; very strongly acid (pH 4.8); clear, wavy boundary; 3 to 7 inches thick.

B21t—9 to 15 inches, yellowish-brown (10YR 5/6) silty clay; few, medium, faint, pale-brown (10YR 6/3) mottles; moderate, medium, subangular blocky structure; friable when moist, plastic when wet; thin, pitted, yellowish-brown (10YR 5/4) clay films slightly paler than matrix; many, small, brown and reddish-brown concretions; very strongly acid (pH 4.8); clear, wavy boundary; 3 to 8 inches thick.

B22t—15 to 21 inches, yellowish-brown (10YR 5/4) silty clay; common, fine, distinct, strong-brown (7.5YR 5/6) mottles; fine, faint, light-gray (10YR 7/1) mottles; and fine, prominent, reddish-brown (5YR 5/4) mottles; weak, medium, prismatic structure breaking to moderate, medium, blocky structure; friable or firm when moist, plastic when wet; distinct clay films (clay films are red (2.5YR 4/6) in spots and are thicker on prisms); many small concretions; very strongly acid (pH 4.8); clear, wavy boundary; 4 to 10 inches thick.

B23t—21 to 28 inches, light yellowish-brown (10YR 6/4) clay; common, fine, prominent, gray (10YR 6/1) mottles; common, fine or medium, prominent, strong-brown (7.5YR 5/8) mottles; and less common, medium, prominent, reddish-brown (5YR 5/4) mottles; weak, medium, prismatic structure breaking to weak, fine or medium, blocky structure; firm when moist, plastic when wet; distinct, light-gray (N 7/0) coatings on peds; some red (2.5YR 4/6) coatings on peds; many, small, brown concretions; very strongly acid (pH 4.8); gradual, wavy boundary; 5 to 11 inches thick.

B24t—28 to 37 inches, yellowish-brown (10YR 5/6) clay; common, fine, prominent, gray (10YR 6/1) and strong-brown (7.5YR 5/6) mottles; weak, medium, prismatic structure breaking to weak, fine, blocky structure; very firm when moist, slightly plastic when wet; abundant black iron or manganese coatings on otherwise gray (10YR 6/1) ped surfaces; many brown and few black concretions; very strongly acid (pH 4.8); abrupt, wavy boundary; 5 to 20 inches thick.

TABLE 11.—*Physical properties*

[Unless otherwise indicated, data were submitted by R. P. Matelski and C. F. Engle, Pennsylvania Agricultural

| Soil name and sample number | Horizon | Depth | Particle-size distribution | | |
|---|---|---|---|---|---|
| | | | Very coarse sand (2.0 to 1.0 mm.) | Coarse sand (1.0 to 0.5 mm.) | Medium sand (0.5 to 0.25 mm.) |
| | | *In.* | *Pct.* | *Pct.* | *Pct.* |
| Atkins silt loam: | | | | | |
| S58Pa32-4-1 | Ap | 0 to 8 | 0.3 | 0.4 | 0.6 |
| S58Pa32-4-2 | B1g | 8 to 16 | 1.2 | 2.3 | 2.5 |
| Brinkerton silt loam: | | | | | |
| S58Pa32-3-1 | Ap | 0 to 8 | .6 | 1.1 | 1.5 |
| S58Pa32-3-2 | B1tg | 8 to 14 | 0 | .2 | 2.2 |
| S58Pa32-3-3 | B21tg | 14 to 21 | .2 | .4 | .7 |
| S58Pa32-3-4 | Bx1g | 21 to 29 | .6 | .8 | 1.2 |
| S58Pa32-3-5 | Bx2g | 29 to 34 | 1.3 | 1.4 | 1.1 |
| S58Pa32-3-6 | Bx3g | 34+ | 1.3 | 1.2 | 1.1 |
| Brinkerton silt loam: | | | | | |
| S61Pa32-50-1 | Ap | 0 to 10 | 2.3 | 3.2 | 3.8 |
| S61Pa32-50-2 | B2tg | 10 to 17 | 0 | .4 | 1.7 |
| S61Pa32-50-3 | Bxg | 17 to 26 | 0 | .3 | 1.3 |
| S61Pa32 50-4 | B31g | 26 to 32 | 0 | .3 | 1.3 |
| S61Pa32-50-5 | B32g | 32 to 39 | .4 | .7 | 2.0 |
| S61Pa32-50-6 | Clg | 39 to 54 | 1.3 | 2.9 | 5.9 |
| S61Pa32-50-7 | C2g | 54 to 60+ | 1.9 | 2.4 | 4.1 |
| Cavode silt loam: | | | | | |
| S58Pa32-2-1 | [2]O2 | 1 to 0 | | | |
| S58Pa32-2-2 | A1 | 0 to 4 | 2.2 | 3.4 | 5.1 |
| S58Pa32-2-3 | A2 | 4 to 6 | 1.0 | 2.1 | 3.2 |
| S58Pa32-2-4 | B1 | 6 to 9 | 1.0 | 1.4 | 1.8 |
| S58Pa32-2-5 | B21t | 9 to 15 | .9 | 1.2 | 1.2 |
| S58Pa32-2-6 | B22t | 15 to 21 | 2.9 | 2.1 | 2.1 |
| S58Pa32-2-7 | B23t | 21 to 28 | 3.1 | 3.3 | 2.6 |
| S58Pa32-2-8 | B24t | 28 to 37 | 3.2 | 2.9 | 2.4 |
| S58Pa32-2-9 | C1 | 37 to 43 | 4.5 | 3.5 | 2.6 |
| Cavode silt loam: | | | | | |
| S61Pa32-59-1 | Ap | 0 to 11 | .6 | 1.6 | 2.7 |
| S61Pa32-59-2 | B1 | 11 to 16 | 0 | .2 | .6 |
| S61Pa32-59-3 | B21t | 16 to 21 | 0 | .1 | .3 |
| S61Pa32-59-4 | B22t | 21 to 30 | .1 | .1 | .2 |
| S61Pa32-59-5 | B3g | 30 to 47 | 1.7 | 1.5 | 1.4 |
| S61Pa32-59-6 | Cg | 47 to 57 | 3.6 | 3.4 | 2.1 |
| Clymer channery loam: | | | | | |
| S61Pa32-55-1 | Ap | 0 to 8 | 4.2 | 11.4 | 18.0 |
| S61Pa32-55-2 | B21t | 8 to 15 | 5.2 | 10.6 | 14.5 |
| S61Pa32-55-3 | B22t | 15 to 24 | 4.3 | 12.4 | 15.7 |
| S61Pa32-55-4 | B3 | 24 to 36 | 7.1 | 17.8 | 13.1 |
| S61Pa32-55-5 | C1 | 36 to 42 | 9.4 | 25.0 | 16.3 |
| S61Pa32-55-6 | C2 | 42+ | | | |
| Clymer channery loam: | | | | | |
| S61Pa32-58-1 | Ap | 0 to 10 | 3.5 | 4.7 | 10.7 |
| S61Pa32-58-2 | B1 | 10 to 15 | 4.9 | 5.1 | 7.4 |
| S61Pa32-58-3 | B2t | 15 to 26 | 4.0 | 4.0 | 6.0 |
| S61Pa32-58-4 | B3 | 26 to 31 | 4.9 | 5.8 | 8.4 |
| S61Pa32-58-5 | C1 | 31 to 38+ | 10.8 | 13.1 | 15.0 |
| Ernest silt loam: | | | | | |
| S58Pa32-1-1 | A1 | 0 to 2½ | .6 | .6 | .8 |
| S58Pa32-1-2 | A2 | 2½ to 5 | .5 | .7 | 1.4 |
| S58Pa32-1-3 | A3 | 5 to 8 | .2 | .6 | .8 |
| S58Pa32-1-4 | B21t | 8 to 11 | .5 | .8 | .7 |
| S58Pa32-1-5 | B22t | 11 to 17 | .5 | .5 | .6 |
| S58Pa32-1-6 | B23tg | 17 to 19 | .6 | .6 | .5 |
| S58Pa32-1-7 | Bx1g | 19 to 22 | .8 | .6 | .5 |
| S58Pa32-1-8 | Bx2g | 22 to 26 | .7 | .9 | .7 |
| S58Pa32-1-9 | B3 | 26 to 32+ | 2.0 | 1.6 | 1.0 |

See footnotes at end of table.

*of selected soils*

Experiment Station, Pennsylvania State University. Dashes in place of an entry indicate that data are not available]

| Particle-size distribution—Continued | | | | Coarse fragments (larger than 2.0 mm.) | Bulk density | Moisture held at tension of ⅓ atmosphere (core) | Moisture held at tension of 15 atmospheres (fragments) | Available moisture |
|---|---|---|---|---|---|---|---|---|
| Fine sand (0.25 to 0.10 mm.) | Very fine sand (0.10 to 0.05 mm.) | Silt (0.05 to 0.002 mm.) | Clay (less than 0.002 mm.) | | | | | |
| *Pct.* | *Pct.* | *Pct.* | *Pct.* | *Pct. by wt.* | *Gm./cc.* | *Pct.* | *Pct.* | *In./in. of soil* |
| 2.2 | 6.3 | 66.4 | 23.8 | [1] 0.2 | [1] 1.22 | ------------ | 11.7 | ------------ |
| 8.9 | 14.9 | 52.1 | 18.1 | [1] .5 | [1] 1.26 | ------------ | 12.0 | ------------ |
| | | | | | | | | |
| 2.2 | 5.8 | 64.0 | 24.8 | [1] .2 | [1] 1.47 | ------------ | 11.1 | ------------ |
| 4.4 | 2.4 | 60.3 | 30.5 | [1] 0 | [1] 1.57 | ------------ | 12.6 | ------------ |
| 2.8 | 8.0 | 59.5 | 28.4 | [1] .2 | [1] 1.62 | ------------ | 12.1 | ------------ |
| 3.3 | 7.4 | 61.9 | 24.8 | [1] .3 | [1] 1.70 | ------------ | 12.3 | ------------ |
| 2.5 | 8.1 | 61.7 | 23.9 | [1] 1.5 | [1] 1.84 | ------------ | 11.6 | ------------ |
| 2.5 | 7.6 | 61.1 | 25.2 | [1] .3 | [1] 1.82 | ------------ | 12.2 | ------------ |
| | | | | | | | | |
| 3.9 | 4.3 | 66.5 | 16.0 | 4 | 1.20 | 34.3 | 16.0 | 0.22 |
| 2.4 | 3.2 | 58.7 | 33.6 | <1 | 1.43 | 25.7 | 14.9 | .15 |
| 2.1 | 2.9 | 53.6 | 39.8 | <1 | 1.43 | 27.9 | 16.8 | .16 |
| 2.0 | 2.8 | 55.3 | 38.3 | <1 | 1.46 | 27.7 | 16.2 | .17 |
| 2.6 | 3.3 | 53.6 | 37.4 | 1 | 1.47 | 26.8 | 16.1 | .16 |
| 5.8 | 5.2 | 51.5 | 27.4 | 1 | 1.72 | 18.8 | 13.4 | .09 |
| 4.8 | 5.2 | 50.7 | 30.9 | 3 | ------------ | ------------ | 14.2 | ------------ |
| | | | | | | | | |
| ------------ | ------------ | ------------ | ------------ | [1] 1.3 | (1) | ------------ | 52.9 | ------------ |
| 6.7 | 6.2 | 58.9 | 17.5 | [1] 7.6 | [1] .97 | ------------ | 11.6 | ------------ |
| 5.2 | 5.3 | 58.7 | 24.5 | [1] 2.7 | [1] 1.26 | ------------ | 11.2 | ------------ |
| 4.0 | 4.7 | 54.2 | 32.9 | [1] 1.7 | [1] 1.41 | ------------ | 14.0 | ------------ |
| 2.0 | 3.1 | 49.3 | 42.3 | [1] 2.6 | [1] 1.51 | ------------ | 18.7 | ------------ |
| 2.1 | 1.3 | 40.4 | 49.1 | [1] 3.6 | [1] 1.53 | ------------ | 20.2 | ------------ |
| 2.3 | 2.2 | 29.2 | 57.3 | [1] 3.5 | [1] 1.67 | ------------ | 19.8 | ------------ |
| 2.1 | 2.1 | 36.7 | 50.6 | [1] 4.9 | [1] 1.77 | ------------ | 17.5 | ------------ |
| 1.8 | 1.9 | 38.9 | 46.8 | [1] 11.1 | [1] 1.89 | ------------ | 17.4 | ------------ |
| | | | | | | | | |
| 4.9 | 13.0 | 61.5 | 15.7 | 2 | 1.29 | 28.7 | 12.2 | .21 |
| 2.0 | 7.5 | 52.9 | 36.8 | 1 | 1.32 | 28.7 | 17.4 | .15 |
| 1.9 | 10.1 | 48.4 | 39.2 | 1 | 1.44 | 27.8 | 18.1 | .14 |
| 2.3 | 9.7 | 49.5 | 38.1 | 1 | 1.43 | 27.6 | 17.6 | .14 |
| 3.8 | 12.9 | 54.3 | 24.4 | 9 | 1.56 | 25.0 | 12.9 | .19 |
| 3.6 | 15.6 | 50.6 | 21.1 | 20 | ------------ | ------------ | 10.0 | ------------ |
| | | | | | | | | |
| 10.3 | 5.8 | 40.2 | 10.1 | 18 | 1.41 | 17.4 | 6.6 | .15 |
| 9.7 | 5.5 | 37.0 | 17.5 | 15 | 1.72 | 14.6 | 7.4 | .12 |
| 9.6 | 5.5 | 38.3 | 14.2 | 34 | 1.74 | 14.8 | 6.2 | .14 |
| 8.6 | 6.4 | 33.8 | 13.2 | 44 | ------------ | ------------ | 5.1 | ------------ |
| 9.2 | 5.6 | 25.5 | 9.0 | 67 | ------------ | ------------ | 3.9 | ------------ |
| ------------ | ------------ | ------------ | ------------ | ------------ | ------------ | ------------ | ------------ | ------------ |
| | | | | | | | | |
| 26.5 | 14.4 | 32.0 | 8.2 | 27 | 1.49 | 16.2 | 6.1 | .11 |
| 15.7 | 14.2 | 36.0 | 16.7 | 47 | 1.72 | 15.0 | 8.4 | .08 |
| 12.5 | 11.8 | 38.9 | 22.8 | 41 | 1.64 | 16.6 | 11.5 | .10 |
| 20.4 | 13.9 | 23.8 | 22.8 | 71 | 1.64 | 14.6 | 10.9 | .11 |
| 23.9 | 9.5 | 16.2 | 11.5 | 85 | ------------ | ------------ | 7.0 | ------------ |
| | | | | | | | | |
| 1.9 | 7.2 | 71.7 | 17.2 | [1] 1.5 | [1] .97 | ------------ | 15.3 | ------------ |
| 2.6 | 7.2 | 72.6 | 15.0 | [1] 2.5 | [1] 1.39 | ------------ | 8.7 | ------------ |
| 3.3 | 5.8 | 65.5 | 23.8 | [1] .4 | [1] 1.46 | ------------ | 11.1 | ------------ |
| 1.9 | 5.4 | 54.4 | 36.3 | [1] .9 | [1] 1.49 | ------------ | 14.7 | ------------ |
| 1.7 | 5.6 | 53.4 | 37.7 | [1] .8 | [1] 1.54 | ------------ | 15.5 | ------------ |
| 1.6 | 5.4 | 55.5 | 35.8 | [1] .8 | [1] 1.56 | ------------ | 14.6 | ------------ |
| 1.4 | 5.1 | 57.0 | 34.6 | [1] 1.3 | [1] 1.63 | ------------ | 14.0 | ------------ |
| 1.4 | 4.9 | 61.7 | 29.7 | [1] 1.5 | [1] 1.68 | ------------ | 13.3 | ------------ |
| 1.5 | 5.1 | 63.0 | 25.8 | [1] 2.5 | [1] 1.68 | ------------ | 11.7 | ------------ |

215-879—67——7

TABLE 11.—*Physical properties*

| Soil name and sample number | Horizon | Depth | Particle-size distribution | | |
|---|---|---|---|---|---|
| | | | Very coarse sand (2.0 to 1.0 mm.) | Coarse sand (1.0 to 0.5 mm.) | Medium sand (0.5 to 0.25 mm.) |
| | | *In.* | *Pct.* | *Pct.* | *Pct.* |
| Ernest silt loam: | | | | | |
| S61Pa32–51–1 | Ap | 0 to 9 | 0. 7 | 1. 6 | 2. 3 |
| S61Pa32–51–2 | B2t | 9 to 17 | 0 | . 2 | . 3 |
| S61Pa32–51–3 | Bx | 17 to 26 | 0 | . 2 | . 2 |
| S61Pa32–51–4 | B3g | 26 to 35 | . 1 | . 6 | . 9 |
| S61Pa32–51–5 | Cg | 35 to 52+ | 6. 2 | 6. 7 | 3. 9 |
| Gilpin channery silt loam: | | | | | |
| S61Pa32–54–1 | Ap | 0 to 9 | 8. 1 | 5. 8 | 4. 7 |
| S61Pa32–54–2 | B1 | 9 to 14 | 8. 1 | 4. 8 | 3. 2 |
| S61Pa32–54–3 | B2t | 14 to 23 | 5. 5 | 4. 4 | 2. 4 |
| S61Pa32–54–4 | B3t | 23 to 26 | 5. 6 | 5. 1 | 3. 3 |
| S61Pa32–54–5 | C | 26 to 30 | 5. 9 | 6. 0 | 3. 6 |
| S61Pa32–54–6 | R | 30+ | 7. 2 | 7. 8 | 6. 2 |
| Gilpin channery silt loam: | | | | | |
| S61Pa32–56–1 | Ap | 0 to 8 | 4. 0 | 3. 4 | 3. 1 |
| S61Pa32–56–2 | B1 | 8 to 13 | 4. 6 | 2. 9 | 2. 1 |
| S61Pa32–56–3 | B2t | 13 to 24 | 5. 1 | 3. 2 | 2. 1 |
| S61Pa32–56–4 | C | 24 to 30 | 5. 8 | 3. 8 | 2. 7 |
| Wharton silt loam: | | | | | |
| S61Pa32–53–1 | Ap | 0 to 10 | 1. 3 | 2. 5 | 3. 4 |
| S61Pa32–53–2 | B1 | 10 to 13 | . 7 | . 9 | . 9 |
| S61Pa32–53–3 | B21t | 13 to 19 | . 9 | . 8 | . 7 |
| S61Pa32–53–4 | B22t | 19 to 24 | 1. 3 | 1. 6 | 1. 3 |
| S61Pa32–53–5 | B23t | 24 to 36 | 2. 6 | 2. 9 | 2. 2 |
| S61Pa32–53–6 | C | 36 to 54+ | 4. 7 | 5. 1 | 3. 5 |
| Wharton silt loam: | | | | | |
| S61Pa32–57–1 | Ap | 0 to 10 | 2. 3 | 4. 2 | 4. 0 |
| S61Pa32–57–2 | B21t | 10 to 15 | . 9 | 1. 6 | 1. 8 |
| S61Pa32–57–3 | B22t | 15 to 25 | 1. 3 | 1. 4 | 1. 3 |
| S61Pa32–57–4 | B23tg | 25 to 37 | 4. 9 | 5. 7 | 3. 5 |
| S61Pa32–57–5 | C | 37 to 50+ | 4. 2 | 7. 1 | 5. 1 |

[1] Values are from doctoral thesis entitled "Quantitative Relationship of Soil Mottling to Natural Soil Drainage Profiles (Aeration Status)," by F. G. LOUGHRY, Pennsylvania State University, 1960.

C—37 to 45 inches +, yellowish-brown (10YR 5/4) clay; many, fine or medium, gray (N 6/0) mottles; weak, medium, prismatic structure breaking to moderate, medium, blocky structure; firm when moist; plastic when wet; oriented clay films on prism faces; some brown and reddish-brown concretions; very strongly acid (pH 4.8). (Fragments of hard shale make up 10 to 15 percent of this horizon. This horizon continues to a depth of 52 inches; prismatic structure is less distinct with depth.)

*Clymer channery loam* (0 to 5 percent slopes). Profile in a hayfield in Canoe Township, half a mile northwest of Locust Lane. This is profile S61Pa32–58 (1–5), for which physical and chemical data are given in tables 11 and 12; profile S61Pa32–55 (1–6) of Clymer channery loam is described in the section "Descriptions of the Soils."

Ap—0 to 10 inches, dark grayish-brown (10YR 4/2), gritty channery loam; weak, medium, granular structure; friable when moist, sticky when wet; slightly acid (pH 6.2) where limed; abrupt, smooth boundary; 7 to 10 inches thick. (Coarse fragments make up about 20 percent of this horizon.)

B1—10 to 15 inches, reddish-yellow (7.5YR 6/6) channery loam; weak, fine, subangular blocky structure; friable when moist, slightly sticky and slightly plastic when wet; very thin, discontinuous clay films; strongly acid (pH 5.5); clear, wavy boundary; 3 to 7 inches thick. (Coarse fragments make up about 20 percent of this horizon.)

B2t—15 to 26 inches, reddish-yellow (7.5YR 6/8) channery loam; moderate, fine or medium, subangular blocky structure; friable when moist, slightly sticky and slightly plastic when wet; thin discontinuous clay films; very strongly acid (pH 4.8); abrupt, wavy boundary; 9 to 13 inches thick. (Coarse fragments make up about 20 percent of this horizon.)

B3—26 to 31 inches, strong-brown (7.5YR 5/6) very channery sandy clay loam; very weak, platy structure or weak, medium, subangular blocky structure; friable or firm when moist (in place), slightly sticky and slightly plastic when wet; extremely acid (pH 4.1); diffuse, wavy boundary; 3 to 7 inches thick. (Clay-coated coarse fragments make up about 90 percent of this horizon.)

C1—31 to 38 inches +, reddish-yellow (7.5YR 6/8) and gray (7.5YR 6/0), weathered, thinly bedded graywacke; platy structure due to bedding and bedding planes; some black coatings on fragments.

*Ernest silt loam* (0 to 3 percent slopes). Profile in a wooded area in East Mahoning Township, three-fourths of a mile northwest of Marion Center. This is profile

*of selected soils*—Continued

| Particle-size distribution—Continued: Fine sand (0.25 to 0.10 mm.) | Very fine sand (0.10 to 0.05 mm.) | Silt (0.05 to 0.002 mm.) | Clay (less than 0.002 mm.) | Coarse fragments (larger than 2.0 mm.) | Bulk density | Moisture held at tension of 1/3 atmosphere (core) | Moisture held at tension of 15 atmospheres (fragments) | Available moisture |
|---|---|---|---|---|---|---|---|---|
| *Pct.* | *Pct.* | *Pct.* | *Pct.* | *Pct. by wt.* | *Gm. /cc.* | *Pct.* | *Pct.* | *In./in. of soil* |
| 3. 7 | 5. 2 | 68. 9 | 17. 6 | 4 | 1. 33 | 28. 0 | 13. 7 | 0. 19 |
| . 6 | 1. 6 | 62. 6 | 34. 7 | 1 | 1. 41 | 25. 8 | 14. 8 | . 15 |
| . 6 | 1. 8 | 62. 6 | 34. 6 | <1 | 1. 43 | 27. 1 | 14. 7 | . 18 |
| 1. 7 | 3. 6 | 65. 4 | 27. 7 | 22 | 1. 57 | 21. 9 | 12. 6 | . 15 |
| 3. 7 | 4. 8 | 48. 9 | 25. 8 | 62 | 1. 78 | 16. 8 | 11. 6 | . 09 |
| | | | | | | | | |
| 8. 3 | 14. 7 | 52. 5 | 5. 9 | 49 | 1. 33 | 20. 1 | 8. 4 | . 16 |
| 5. 9 | 11. 7 | 54. 9 | 11. 4 | 43 | 1. 36 | 21. 3 | 8. 2 | . 18 |
| 4. 1 | 10. 9 | 50. 1 | 22. 6 | 39 | 1. 59 | 18. 0 | 9. 3 | . 14 |
| 3. 4 | 7. 1 | 54. 3 | 21. 2 | 51 | 1. 65 | 17. 6 | 9. 2 | . 14 |
| 3. 3 | 7. 1 | 53. 3 | 20. 8 | 69 | ----------- | ----------- | 9. 2 | ----------- |
| 8. 7 | 11. 1 | 40. 4 | 18. 6 | 79 | ----------- | ----------- | 9. 0 | ----------- |
| | | | | | | | | |
| 3. 7 | 17. 2 | 60. 2 | 8. 4 | 47 | 1. 33 | 22. 6 | 10. 2 | . 16 |
| 2. 7 | 11. 6 | 55. 4 | 20. 7 | 35 | 1. 47 | 20. 2 | 9. 7 | . 15 |
| 2. 5 | 10. 4 | 51. 4 | 25. 3 | 37 | 1. 43 | 20. 8 | 12. 1 | . 12 |
| 2. 8 | 11. 3 | 47. 7 | 25. 9 | 50 | 1. 56 | 20. 4 | 12. 4 | . 12 |
| | | | | | | | | |
| 4. 3 | 5. 8 | 69. 7 | 13. 0 | 12 | 1. 26 | 28. 5 | 13. 0 | . 20 |
| 1. 9 | 3. 8 | 55. 6 | 36. 2 | 31 | 1. 38 | 29. 2 | 17. 7 | . 16 |
| 2. 0 | 4. 4 | 58. 9 | 32. 3 | 7 | 1. 44 | 27. 2 | 16. 4 | . 16 |
| 1. 8 | 4. 3 | 62. 5 | 27. 2 | 10 | 1. 58 | 23. 2 | 14. 0 | . 15 |
| 2. 1 | 4. 8 | 61. 2 | 24. 2 | 20 | 1. 63 | 22. 3 | 12. 5 | . 16 |
| 2. 9 | 5. 5 | 62. 5 | 21. 6 | 26 | 1. 77 | 18. 0 | 11. 3 | . 12 |
| | | | | | | | | |
| 4. 2 | 7. 5 | 59. 2 | 18. 6 | 5 | 1. 16 | 28. 4 | 13. 5 | . 17 |
| 1. 8 | 5. 6 | 51. 3 | 37. 0 | 2 | 1. 42 | 25. 7 | 16. 1 | . 14 |
| 5. 4 | 5. 2 | 39. 9 | 45. 5 | 3 | 1. 44 | 29. 0 | 19. 5 | . 14 |
| 2. 5 | 1. 8 | 49. 8 | 31. 8 | 34 | 1. 73 | 19. 0 | 13. 1 | . 10 |
| 3. 1 | 1. 0 | 46. 7 | 32. 8 | 33 | 1. 82 | 16. 1 | 13. 3 | . 05 |

[2] An O1 horizon (1½ inches to 1 inch in thickness) consisting of leaf litter was not sampled.

S58Pa32-1 (1-9), for which physical and chemical data are given in tables 11 and 12; profile S61Pa32-51 (1-5), also of Ernest silt loam, is described in the section "Descriptions of the Soils."

O1—½ inch to 0, matted pine and spruce needles, hardwood-tree leaves, grass, and grass roots; 0 to 1 inch thick.

A1—0 to 2½ inches, very dark gray (10YR 3/1) silt loam; weak, fine, granular structure; very friable when moist, nonsticky when wet; many dark-gray concretions that crush to dark brown; very strongly acid (pH 5.0); clear, wavy boundary; 1 to 4 inches thick.

A2—2½ to 5 inches, yellowish-brown (10YR 5/4) silt loam; weak, thin or medium, platy structure; friable when moist, nonsticky and nonplastic when wet; very strongly acid (pH 4.8); clear, wavy boundary; 1 to 5 inches thick.

A3—5 to 8 inches, yellowish-brown (10YR 5/6) silt loam; weak to moderate, fine or medium, subangular blocky structure; friable when moist; silt films, and some silt and clay films in fine pores; few dusky-red concretions; very strongly acid (pH 4.8); clear, wavy boundary; 2 to 4 inches thick.

B21t—8 to 11 inches, yellowish-brown (10YR 4/2) silty clay loam; moderate, medium, subangular blocky structure; friable when moist, slightly plastic when wet; pitted clay films; few large concretions; very strongly acid (pH 4.8); gradual, wavy boundary; 2 to 4 inches thick.

B22t—11 to 17 inches, yellowish-brown (10YR 5/4) silty clay loam; common, fine, distinct, strong-brown (7.5YR 5/8) and brownish-yellow (10YR 6/6) mottles near top of horizon; light yellowish-brown (10YR 6/4) matrix and common, medium, distinct, strong-brown (7.5YR 5/8), light brownish-gray (2.5Y 6/2), and dark-brown (7.5YR 3/4) mottles in the lower part; mottling increases with depth; moderate, fine or medium, blocky structure; firm when moist, plastic and slightly sticky when wet; continuous clay films; few, small, brown concretions; some old root channels up to 3.4 inches in diameter filled with soil that is grayer and more silty than the rest of the horizon; very strongly acid (pH 4.8); clear, wavy boundary; 5 to 10 inches thick. (Fragments up to 2 inches long make up about 2 percent of this horizon.)

B23tg—17 to 19 inches, grayish-brown (10YR 5/2) silty clay loam; prominent, strong-brown (7.5YR 5/8) mottles and streaks and many, fine, prominent, light olive-gray (5Y 6/2) mottles and coatings; weak, fine, blocky structure and moderate, medium, platy structure; firm when moist, nonplastic and slightly sticky when wet; clay films; some, large, brown concretions; strongly acid (pH 5.4); clear, smooth boundary; 2 to 3 inches thick.

TABLE 12.—*Chemical*

[Unless otherwise indicated, data were submitted by R. P. Matelski and C. F. Engle, Pennsylvania Agricultural Experiment Station deriving

| Soil name and sample number | Horizon | Depth | Organic carbon | Nitrogen | Carbon-nitrogen ratio | Calcium-magnesium ratio | Reaction (laboratory) |
|---|---|---|---|---|---|---|---|
| | | *In.* | *Pct.* | *Pct.* | | | *pH* |
| Atkins silt loam: | | | | | | | |
| S58Pa32-4-1 | Ap | 0 to 8 | 1.79 | 0.200 | 9 | 2.7 | 4.9 |
| S58Pa32-4-2 | Blg | 8 to 16 | 1.89 | .153 | 12 | 1.4 | 5.0 |
| Brinkerton silt loam: | | | | | | | |
| S58Pa32-3-1 | Ap | 0 to 8 | 1.66 | .171 | 10 | | 6.4 |
| S58Pa32-3-2 | Bltg | 8 to 14 | .35 | .073 | 5 | 1.6 | 4.8 |
| S58Pa32-3-3 | B21tg | 14 to 21 | .35 | .067 | 5 | .5 | 4.9 |
| S58Pa32-3-4 | Bxlg | 21 to 29 | .35 | .068 | 5 | .4 | 5.0 |
| S58Pa32-3-5 | Bx2g | 29 to 34 | .41 | .068 | 6 | .5 | 5.2 |
| S58Pa32-3-6 | Bx3g | 34+ | .43 | .055 | 8 | .6 | 6.1 |
| Brinkerton silt loam: | | | | | | | |
| S61Pa32-50-1 | Ap | 0 to 10 | 2.35 | .258 | 9 | 5.8 | 5.6 |
| S61Pa32-50-2 | B21tg | 10 to 17 | .60 | .100 | 6 | 2.0 | 5.0 |
| S61Pa32-50-3 | Bxg | 17 to 26 | .14 | .074 | | 1.7 | 5.2 |
| S61Pa32-50-4 | B31g | 26 to 32 | .22 | .067 | | 1.6 | 5.2 |
| S61Pa32-50-5 | B32g | 32 to 39 | .20 | .070 | | 1.6 | 5.3 |
| S61Pa32-50-6 | C1g | 39 to 54 | .20 | .068 | | 1.5 | 5.5 |
| S61Pa32-50-7 | C2g | 54 to 60+ | .24 | | | 1.5 | 6.4 |
| Cavode silt loam: | | | | | | | |
| S58Pa32-2-1 | [2]O2 | 1 to 0 | 18.68 | .893 | 21 | | 4.8 |
| S58Pa32-2-2 | A1 | 0 to 4 | 1.85 | .162 | 11 | | 4.8 |
| S58Pa32-2-3 | A2 | 4 to 6 | .88 | .094 | 9 | | 4.8 |
| S58Pa32-2-4 | B1 | 6 to 9 | .49 | .077 | 6 | | 4.6 |
| S58Pa32-2-5 | B21t | 9 to 15 | .34 | .066 | 5 | | 4.7 |
| S58Pa32-2-6 | B22t | 15 to 21 | .28 | | | | 4.7 |
| S58Pa32-2-7 | B23t | 21 to 28 | .28 | | | | 4.7 |
| S58Pa32-2-8 | B24t | 28 to 37 | .23 | | | | 4.7 |
| S58Pa32-2-9 | C1 | 37 to 43 | .23 | | | | 4.9 |
| Cavode silt loam: | | | | | | | |
| S61Pa32-59-1 | Ap | 0 to 11 | 1.75 | .186 | 9 | | 5.2 |
| S61Pa32-59-2 | B1 | 11 to 16 | .72 | .106 | 7 | | 5.0 |
| S61Pa32-59-3 | B21t | 16 to 21 | .42 | .083 | 5 | | 4.9 |
| S61Pa32-59-4 | B22t | 21 to 30 | .28 | .067 | 4 | | 4.8 |
| S61Pa32-59-5 | B3g | 30 to 47 | .20 | .060 | | | 4.7 |
| S61Pa32-59-6 | Cg | 47 to 57 | .10 | .054 | | | 4.9 |
| Clymer channery loam: | | | | | | | |
| S61Pa32-55-1 | Ap | 0 to 8 | 1.39 | .120 | 12 | | 4.8 |
| S61Pa32-55-2 | B21t | 8 to 15 | .16 | .041 | | | 4.9 |
| S61Pa32-55-3 | B22t | 15 to 24 | .06 | .034 | | | 4.8 |
| S61Pa32-55-4 | B3 | 24 to 36 | .02 | .059 | | | 4.8 |
| S61Pa32-55-5 | C1 | 36 to 42 | .04 | .026 | | | 4.6 |
| Clymer channery loam: | | | | | | | |
| S61Pa32-58-1 | Ap | 0 to 10 | 1.23 | .118 | 10 | | 6.1 |
| S61Pa32-58-2 | B1 | 10 to 15 | .26 | .054 | 5 | | 5.4 |
| S61Pa32-58-4 | B2t | 15 to 26 | .16 | .052 | | | 4.8 |
| S61Pa32-58-4 | B3 | 26 to 31 | .14 | .047 | | | 4.8 |
| S61Pa32-58-5 | C1 | 31 to 38+ | .12 | .034 | | | 4.8 |
| Ernest silt loam: | | | | | | | |
| S58Pa32-1-1 | A1 | 0 to 2½ | 4.00 | .334 | 12 | | 4.4 |
| S58Pa32-1-2 | A2 | 2½ to 5 | 1.22 | .131 | 9 | | 4.6 |
| S58Pa32-1-3 | A3 | 5 to 8 | .59 | .092 | 6 | | 4.8 |
| S58Pa32-1-4 | B21t | 8 to 11 | .38 | .086 | 4 | | 4.9 |
| S58Pa32-1-5 | B22t | 11 to 17 | .34 | .081 | 4 | | 4.9 |
| S58Pa32-1-6 | B23tg | 17 to 19 | .32 | | | 9 | 4.8 |
| S58Pa32-1-7 | Bx1g | 19 to 22 | .25 | | | | 4.8 |
| S58Pa32-1-8 | Bx2g | 22 to 26 | .21 | | | | 4.8 |
| S58Pa32-1-9 | B3 | 26 to 32+ | .21 | | | | 4.8 |

See footnotes at end of table.

*properties of selected soils*

Pennsylvania State University. Dashes in place of an entry indicate that data are not available, or that quantities are not sufficient for ratios]

| Extractable cations (milliequivalents per 100 grams of soil) | | | | | Cation exchange capacity (sum) | Base saturation (sum) | Mineral composition of clay fraction [1] | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Ca | Mg | Na | K | H | | | Kaolinite | Illite | Vermiculite | Chlorite | Montmorillonite | Interstratified |
| | | | | | *Meq./100 gm.* | *Pct.* | *Pct.* | *Pct.* | *Pct.* | *Pct.* | *Pct.* | *Pct.* |
| 3.2 | 1.2 | 0.1 | 0.2 | 15.3 | 20.0 | 24 | 25 | 40 | 30 | --- | --- | 5 |
| 2.0 | 1.4 | .1 | .1 | 15.8 | 19.4 | 19 | 30 | 40 | 20 | --- | --- | 10 |
| | | | | | | | | | | | | |
| 11.0 | .7 | .2 | .2 | 7.6 | 19.7 | 61 | 25 | 40 | 20 | 5 | 5 | 5 |
| 2.5 | 1.6 | .1 | .2 | 14.9 | 19.3 | 23 | --- | --- | --- | --- | --- | --- |
| 1.4 | 2.7 | .2 | .2 | 13.9 | 18.4 | 24 | 25 | 50 | 15 | --- | 5 | 5 |
| 1.7 | 4.1 | .2 | .2 | 12.8 | 19.0 | 33 | --- | --- | --- | --- | --- | --- |
| 3.0 | 6.2 | .2 | .2 | 9.3 | 18.9 | 51 | 25 | 50 | 15 | --- | 5 | 5 |
| 4.7 | 8.4 | .3 | .2 | 5.5 | 19.1 | 71 | 25 | 55 | 10 | --- | 5 | 5 |
| | | | | | | | | | | | | |
| 9.3 | 1.6 | .3 | .2 | 11.7 | 23.1 | 49 | 30 | 40 | 15 | 5 | --- | 10 |
| 5.2 | 2.6 | .2 | .2 | 11.9 | 20.1 | 41 | --- | --- | --- | --- | --- | --- |
| 5.7 | 3.3 | .2 | .3 | 11.7 | 21.2 | 45 | 25 | 50 | 15 | --- | --- | 10 |
| 5.0 | 3.1 | .2 | .3 | 10.3 | 18.9 | 46 | --- | --- | --- | --- | --- | --- |
| 6.6 | 4.2 | .2 | .3 | 9.9 | 21.2 | 53 | 25 | 55 | 10 | --- | --- | 10 |
| 8.9 | 6.1 | .3 | .3 | 6.7 | 22.3 | 70 | 15 | 65 | 10 | --- | --- | 10 |
| 10.5 | 6.9 | .3 | .2 | 3.3 | 21.2 | 84 | 15 | 65 | 10 | --- | --- | 10 |
| | | | | | | | | | | | | |
| 9.7 | .2 | .2 | 1.2 | 38.7 | 50.0 | 23 | --- | --- | --- | --- | --- | --- |
| .3 | .3 | .2 | .2 | 16.4 | 17.4 | 6 | 35 | 25 | 30 | --- | --- | 10 |
| .2 | .3 | .1 | .2 | 13.5 | 14.3 | 6 | --- | --- | --- | --- | --- | --- |
| .1 | .4 | .1 | .2 | 13.9 | 14.7 | 5 | 35 | 45 | 10 | --- | --- | 10 |
| .4 | .5 | .1 | .3 | 15.6 | 16.9 | 8 | --- | --- | --- | --- | --- | --- |
| .8 | 1.8 | .2 | .3 | 18.2 | 21.3 | 15 | 25 | 60 | --- | 5 | --- | 10 |
| .3 | 3.1 | .2 | .4 | 18.7 | 22.7 | 18 | --- | --- | --- | --- | --- | --- |
| .5 | 3.7 | .2 | .3 | 16.8 | 21.5 | 22 | 25 | 60 | --- | 5 | --- | 10 |
| .4 | 5.2 | .2 | .4 | 17.5 | 23.7 | 26 | 25 | 65 | --- | --- | 5 | 5 |
| | | | | | | | | | | | | |
| 5.1 | .4 | .2 | .2 | 13.8 | 19.7 | 30 | 45 | 30 | 20 | --- | --- | 5 |
| 3.5 | .3 | .3 | .2 | 15.5 | 19.8 | 22 | --- | --- | --- | --- | --- | --- |
| 3.1 | .5 | .1 | .3 | 15.9 | 19.9 | 20 | 40 | 30 | 10 | 5 | 5 | 10 |
| 2.2 | .4 | .1 | .3 | 17.4 | 20.4 | 15 | --- | --- | --- | --- | --- | --- |
| 1.0 | .8 | .1 | .2 | 14.3 | 16.4 | 13 | 30 | 50 | 5 | 5 | 5 | 5 |
| .1 | 2.1 | .1 | .2 | 11.0 | 13.5 | 19 | 35 | 55 | 5 | --- | --- | 5 |
| | | | | | | | | | | | | |
| .4 | 0 | .2 | .2 | 9.5 | 10.3 | 8 | 35 | 20 | 35 | 5 | --- | 5 |
| 1.2 | .1 | .2 | .2 | 7.6 | 9.3 | 18 | --- | --- | --- | --- | --- | --- |
| 1.1 | .4 | .1 | .2 | 7.0 | 8.8 | 22 | 30 | 35 | 20 | --- | 10 | 5 |
| .5 | .2 | .1 | .1 | 5.6 | 6.5 | 14 | --- | --- | --- | --- | --- | --- |
| .4 | .1 | .1 | .1 | 4.3 | 5.0 | 14 | 35 | 35 | 20 | --- | 5 | 5 |
| | | | | | | | | | | | | |
| 5.1 | <.1 | .1 | .2 | 3.9 | 10.1 | 61 | 35 | 20 | 30 | 5 | --- | 10 |
| 3.9 | .1 | .1 | .2 | 5.5 | 9.8 | 44 | --- | --- | --- | --- | --- | --- |
| 2.2 | <.1 | .1 | .2 | 10.7 | 13.2 | 19 | 35 | 45 | 10 | --- | --- | 10 |
| 1.4 | .2 | .1 | .2 | 10.7 | 12.6 | 15 | --- | --- | --- | --- | --- | --- |
| 1.1 | .2 | .1 | .2 | 6.9 | 8.5 | 19 | --- | --- | --- | --- | --- | --- |
| | | | | | | | | | | | | |
| .8 | .5 | .2 | .5 | 18.6 | 20.6 | 10 | 25 | 40 | 15 | 5 | --- | 15 |
| .8 | .2 | .2 | .2 | 14.5 | 15.9 | 9 | --- | --- | --- | --- | --- | --- |
| 1.0 | .4 | .1 | .2 | 14.2 | 15.9 | 11 | 30 | 30 | 30 | --- | --- | 10 |
| 1.7 | .6 | .1 | .2 | 16.6 | 19.2 | 14 | --- | --- | --- | --- | --- | --- |
| 1.4 | .7 | .1 | .2 | 17.0 | 19.4 | 12 | 30 | 40 | 20 | --- | --- | 10 |
| 1.1 | 1.2 | .1 | .2 | 16.9 | 19.5 | 13 | --- | --- | --- | --- | --- | --- |
| .7 | 1.5 | .1 | .3 | 16.7 | 19.3 | 14 | 25 | 55 | 5 | 5 | 5 | 5 |
| .5 | 1.9 | .2 | .3 | 16.1 | 19.0 | 15 | --- | --- | --- | --- | --- | --- |
| .1 | 2.3 | .2 | .3 | 15.2 | 18.1 | 16 | 20 | 60 | --- | 5 | 10 | 5 |

TABLE 12.—*Chemical properties*

| Soil name and sample number | Horizon | Depth | Organic carbon | Nitrogen | Carbon-nitrogen ratio | Calcium-magnesium ratio | Reaction (laboratory) |
|---|---|---|---|---|---|---|---|
| | | *In.* | *Pct.* | *Pct.* | | | *pH* |
| Ernest silt loam: | | | | | | | |
| S61Pa32-51-1 | Ap | 0 to 9 | 2. 01 | 0. 233 | 9 | --- | 5. 8 |
| S61Pa32-51-2 | B2t | 9 to 17 | . 34 | . 076 | 4 | 5. 5 | 5. 0 |
| S61Pa32-51-3 | Bx | 17 to 26 | . 28 | . 081 | 4 | 2. 7 | 4. 7 |
| S61Pa32-51-4 | B3g | 26 to 35 | . 18 | --- | --- | 1. 4 | 4. 8 |
| S61Pa32-51-5 | Cg | 35 to 52+ | . 18 | --- | --- | 1. 2 | 5. 2 |
| Gilpin channery silt loam: | | | | | | | |
| S61Pa32-54-1 | Ap | 0 to 9 | 1. 99 | . 199 | 10 | --- | 6. 6 |
| S61Pa32-54-2 | B1 | 9 to 14 | 1. 24 | . 136 | 9 | --- | 6. 1 |
| S61Pa32-54-3 | B2t | 14 to 23 | . 25 | --- | --- | --- | 5. 3 |
| S61Pa32-54-4 | B3t | 23 to 26 | . 14 | --- | --- | --- | 5. 2 |
| S61Pa32-54-5 | C | 26 to 30 | . 19 | --- | --- | --- | 5. 0 |
| S61Pa32-54-6 | R | 30+ | . 35 | --- | --- | --- | 5. 0 |
| Gilpin channery silt loam: | | | | | | | |
| S61Pa32-56-1 | Ap | 0 to 8 | 1. 10 | . 214 | 5 | --- | 5. 8 |
| S61Pa32-56-2 | B1 | 8 to 13 | . 50 | . 078 | 6 | --- | 5. 5 |
| S61Pa32-56-3 | B2t | 13 to 24 | . 44 | . 078 | 6 | --- | 5. 1 |
| S61Pa32-56-4 | C | 24 to 30+ | . 44 | . 076 | 6 | --- | 4. 8 |
| Wharton silt loam: | | | | | | | |
| S61Pa32-53-1 | Ap | 0 to 10 | 1. 92 | . 189 | 10 | --- | 6. 2 |
| S61Pa32-53-2 | B1 | 10 to 13 | . 42 | . 104 | 4 | --- | 4. 8 |
| S61Pa32-53-3 | B21t | 13 to 19 | . 30 | . 082 | 4 | --- | 5. 0 |
| S61Pa32-53-4 | B22t | 19 to 24 | . 20 | --- | --- | 1. 8 | 4. 9 |
| S61Pa32-53-5 | B23t | 24 to 36 | . 15 | --- | --- | . 8 | 5. 0 |
| S61Pa32-53-6 | C | 36 to 54+ | . 12 | --- | --- | . 4 | 4. 9 |
| Wharton silt loam: | | | | | | | |
| S61Pa32-57-1 | Ap | 0 to 10 | 2. 02 | . 227 | 9 | --- | 5. 3 |
| S61Pa32-57-2 | B21t | 10 to 15 | . 40 | . 090 | 4 | --- | 4. 6 |
| S61Pa32-57-3 | B22t | 15 to 25 | . 30 | . 080 | 4 | --- | 4. 6 |
| S61Pa32-57-4 | B23tg | 25 to 37 | . 32 | . 091 | 4 | . 6 | 4. 6 |
| S61Pa32-57-5 | C | 37 to 50+ | . 42 | . 096 | 4 | --- | 4. 6 |

[1] Determined by L. J. JOHNSON, Pennsylvania State University; values were determined to the nearest 5 percent and are based on peak height and the relationship to known clay mixtures.

Bx1g—19 to 22 inches, yellowish-brown (10YR 5/4) silty clay loam; many, medium, prominent, yellowish-red (5YR 4/6) and gray (N 6/0) streaks and mottles; moderate, medium to coarse, blocky structure with gray (N 6/0), clay films up to 1 millimeter in thickness; dense and firm when moist, plastic when wet; some, large, strong-brown concretions; very strongly acid (pH 4.8); clear, wavy boundary; 2 to 5 inches thick.

Bx2g—22 to 26 inches, yellowish-brown (10YR 5/4) silty clay loam; many, medium, prominent, gray (N 6/0) streaks and coatings and many, medium, prominent, yellowish-red (5YR 4/6) streaks and mottles; gray (N 6/0) coatings higher in clay content than ped interiors; moderate, medium or fine, blocky structure; firm when moist, slightly plastic when wet; few small concretions; very strongly acid (pH 4.8); clear, smooth boundary; 3 to 5 inches thick.

B3—26 to 32 inches +, yellowish-brown (10YR 5/4) silt loam approaching silty clay loam; many, medium, prominent, yellowish-red (5YR 4/6) mottles and common, fine, prominent, gray (N 5/0) mottles; weak, medium, blocky structure; firm when moist, slightly plastic when wet; some clay films; some brown concretions up to 8x6x3 millimeters in size; very strongly acid (pH 4.8). (This horizon continues to a depth of 36 to 42 inches; it is less mottled with depth and grades to the C horizon. The C horizon was not sampled.)

*Gilpin channery silt loam* (0 to 5 percent slopes). Profile in a hayfield in North Mahoning Township, 1 mile north of Covode. This is profile S61Pa32-54 (1-6), for which physical and chemical data are given in tables 11 and 12; profile S61Pa32-56 (1-4), also of Gilpin channery silt loam, is described in the section "Descriptions of the Soils."

Ap—0 to 9 inches, dark grayish-brown (10YR 4/2) channery silt loam; weak, fine, granular structure; friable when moist; slightly acid (pH 6.2) where limed; clear, smooth boundary; 7 to 11 inches thick. (Coarse fragments make up about 30 percent of this horizon.)

B1—9 to 14 inches, brown (10YR 5/3) channery silt loam; weak, fine or medium, subangular blocky structure; friable when moist, slightly sticky and slightly plastic when wet; medium acid (pH 5.8); clear, wavy boundary; 3 to 6 inches thick. (Coarse fragments make up about 25 percent of this horizon.)

B2t—14 to 23 inches, yellowish-brown (10YR 5/4) channery silt loam; moderate, medium, subangular blocky structure; friable when moist, sticky and plastic when wet; thick, patchy clay films in pores; strongly acid (pH 5.2); gradual, wavy boundary; 8 to 11

*of selected soils*—Continued

| Extractable cations (milliequivalents per 100 grams of soil) | | | | | Cation exchange capacity (sum) | Base saturation (sum) | Mineral composition of clay fraction [1] | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Ca | Mg | Na | K | H | | | Kaolinite | Illite | Vermiculite | Chlorite | Montmorillonite | Interstratified |
| | | | | | Meq./100 gms. | Pct. | Pct. | Pct. | Pct. | Pct. | Pct. | Pct. |
| 9.3 | 0.9 | 0.3 | 0.4 | 10.0 | 20.9 | 52 | 25 | 40 | 20 | -------- | -------- | 15 |
| 6.1 | 1.1 | .2 | .3 | 11.7 | 19.4 | 40 | -------- | -------- | -------- | -------- | -------- | -------- |
| 7.1 | 2.6 | .2 | .4 | 13.4 | 23.7 | 43 | 20 | 45 | 20 | -------- | -------- | 15 |
| 5.7 | 4.0 | .2 | .4 | 11.9 | 22.2 | 46 | -------- | -------- | -------- | -------- | -------- | -------- |
| 7.0 | 5.7 | .3 | .3 | 8.9 | 22.2 | 60 | 20 | 60 | 10 | -------- | -------- | 10 |
| | | | | | | | | | | | | |
| 7.3 | .7 | .2 | .4 | 6.7 | 15.3 | 56 | 35 | 30 | 25 | -------- | -------- | 10 |
| 3.4 | .4 | .2 | .3 | 8.8 | 13.1 | 33 | -------- | -------- | -------- | -------- | -------- | -------- |
| 3.0 | .2 | .1 | .2 | 8.2 | 11.7 | 30 | 35 | 35 | 25 | -------- | -------- | 5 |
| 2.5 | .7 | .1 | .2 | 10.2 | 13.7 | 26 | -------- | -------- | -------- | -------- | -------- | -------- |
| 1.8 | .5 | .1 | .2 | 11.0 | 13.6 | 19 | 35 | 40 | 20 | -------- | -------- | 5 |
| 1.5 | .3 | .1 | .3 | 9.4 | 11.6 | 19 | -------- | -------- | -------- | -------- | -------- | -------- |
| | | | | | | | | | | | | |
| 6.6 | .3 | .1 | .3 | 10.2 | 17.5 | 42 | 35 | 30 | 30 | -------- | -------- | 5 |
| 3.7 | .1 | .1 | .2 | 6.9 | 11.0 | 37 | -------- | -------- | -------- | -------- | -------- | -------- |
| 2.3 | .3 | .1 | .2 | 12.0 | 14.9 | 19 | 30 | 35 | 25 | -------- | 5 | 5 |
| 2.2 | .3 | .1 | .3 | 13.4 | 16.3 | 18 | 30 | 50 | 10 | -------- | 5 | 5 |
| | | | | | | | | | | | | |
| 8.4 | .4 | .2 | .4 | 8.2 | 17.6 | 53 | 30 | 35 | 30 | -------- | -------- | 5 |
| 3.8 | .9 | .2 | .4 | 14.3 | 19.6 | 27 | -------- | -------- | -------- | -------- | -------- | -------- |
| 3.1 | .9 | .2 | .4 | 13.6 | 18.2 | 25 | 35 | 45 | 10 | -------- | -------- | 10 |
| 2.2 | 1.2 | .1 | .3 | 13.3 | 17.1 | 22 | -------- | -------- | -------- | -------- | -------- | -------- |
| 1.3 | 1.7 | .1 | .3 | 13.6 | 17.0 | 20 | 30 | 55 | 10 | -------- | -------- | 5 |
| .8 | 2.1 | .1 | .2 | 13.0 | 16.2 | 20 | -------- | -------- | -------- | -------- | -------- | -------- |
| | | | | | | | | | | | | |
| 7.5 | .5 | .1 | .4 | 11.6 | 20.1 | 42 | 45 | 30 | 15 | -------- | 5 | 5 |
| 3.1 | .4 | .1 | .3 | 13.9 | 17.8 | 22 | -------- | -------- | -------- | -------- | -------- | -------- |
| 3.4 | .8 | .1 | .3 | 15.2 | 19.8 | 23 | 25 | 55 | 10 | -------- | -------- | 10 |
| 1.2 | 2.1 | .2 | .3 | 16.1 | 19.9 | 19 | -------- | -------- | -------- | -------- | -------- | -------- |
| .7 | 2.6 | .2 | .3 | 16.4 | 20.2 | 19 | 25 | 65 | 5 | -------- | -------- | 5 |

[2] An O1 horizon (1½ inches to 1 inch in thickness) consisting of leaf litter was not sampled.

inches thick. (Coarse fragments make up about 25 percent of this horizon.)

B3t—23 to 26 inches, yellowish-brown (10YR 5/4) channery silt loam; moderate, medium, subangular blocky structure (near platy in places); friable when moist, slightly sticky and slightly plastic when wet; patchy clay films, and clay films lining pores; very strongly acid (pH 4.9); clear, wavy boundary; 2 to 5 inches thick. (Coarse fragments make up 25 to 30 percent of this horizon.)

C—26 to 30 inches, brown (10YR 5/3) very channery loam; weak, medium, platy structure; friable when moist, slightly sticky and slightly plastic when wet; very strongly acid (pH 4.6); abrupt, irregular boundary; 3 to 8 inches thick. (Coarse fragments make up about 80 percent of this horizon; silt and clay deposits are on fragments and in voids.)

R—30 inches +, olive-gray (5Y 4/2) partly weathered, thinly bedded siltstone; very strongly acid (pH 4.8).

*Wharton silt loam* (0 to 3 percent slopes). Profile in a hayfield in North Mahoning Township, 1 mile north of Covode. This is profile S61Pa32–53 (1–6), for which physical and chemical data are given in tables 11 and 12; profile S61Pa32–57 (1–5), also of Wharton silt loam, is described in the section "Descriptions of the Soils."

Ap—0 to 10 inches, dark grayish-brown (10YR 4/2) silt loam; moderate, medium, granular structure; friable when moist, slightly sticky and slightly plastic when wet; slightly acid (pH 6.5) where limed; clear, smooth boundary; 8 to 12 inches thick. (Coarse fragments make up 5 to 10 percent of this horizon.)

B1—10 to 13 inches, yellowish-brown (10YR 5/4) light silty clay loam; moderate, fine, subangular blocky structure; friable when moist, slightly sticky and slightly plastic when wet; strongly acid (pH 5.2); clear, wavy boundary; 0 to 4 inches thick. (Coarse fragments make up 15 to 20 percent of this horizon.)

B21t—13 to 19 inches, yellowish-brown (10YR 5/6) silty clay loam; moderate, medium, subangular blocky structure; firm when moist, sticky and plastic when wet; continuous clay films; very strongly acid (pH 5.0); gradual, wavy boundary; 5 to 17 inches thick.

B22t—19 to 24 inches, light yellowish-brown (10YR 6/4) silty clay loam; common, medium, distinct, pale-red (2.5 YR 6/2) and reddish-yellow (7.5YR 6/6) mottles; moderate, medium, subangular blocky structure; firm when moist, sticky and plastic when wet; thick, continuous clay films; strongly acid (pH 5.1); clear, wavy boundary; 4 to 15 inches thick. (Coarse fragments make up 5 to 10 percent of this horizon.)

B23t—24 to 36 inches, light brownish-gray (2.5Y 6/2) silt loam; many, medium, distinct, yellowish-brown (10 YR 5/6) and brown (7.5YR 5/4) mottles; strong, medium and coarse, prismatic structure breaking to moderate, medium, blocky; very firm when moist, sticky and plastic when wet; thick, continuous clay

films; common, black coatings; strongly acid (pH 5.1); gradual, wavy boundary; 4 to 15 inches thick. (Coarse fragments make up 10 to 15 percent of this horizon.)

C—36 to 54 inches +, yellowish-brown (10YR 5/4) silt loam; many, medium and coarse, distinct, light-gray (N 7/0) and brown (7.5YR 5/4) mottles; strong, coarse, prismatic structure breaking to weak, medium, subangular blocky; firm when moist, sticky and plastic when wet; clay deposits in voids and cracks; strongly acid (pH 5.1). (Coarse fragments make up about 20 percent of this horizon.)

## Laboratory Methods

In preparation for laboratory analyses, air-dry samples were crushed with a rolling pin so that the soil material would pass through a 2-millimeter sieve. Care was taken to avoid fragmenting the nonsoil material. The percentage of material larger than 2 millimeters is reported in table 11 as coarse fragments. All laboratory determinations in tables 11 and 12, except those for bulk density and moisture retention at ⅓ atmosphere, are for only that part of the sample that is less than 2 millimeters in diameter.

Particle-size distribution was made by the pipette method (*4*, *5*). Mechanical shaking was used to disperse the particles in sodium hexametaphosphate.

Bulk density was determined on 1- by 2-inch cylindrical core samples taken with a modified Uhland core sampler (*14*, *15*).

Moisture held at 15 atmospheres tension was determined on fragmented samples with pressure-membrane apparatus (*10*).

Soil reaction was determined with a Beckman zeromatic pH meter, using a soil-water ratio of 1:1.

Organic carbon was determined by wet combustion; the procedure is a modification of the Walkley-Black method (*8*).

Nitrogen was determined by the Kjeldahl method (*2*), modified by trapping ammonia in a boric acid solution and titrating with sulfuric acid.

Extractable calcium, magnesium, sodium, and potassium were determined by extraction with neutral, normal ammonium acetate (*8*). Extractable hydrogen was determined by using a barium chloride solution buffered at pH 8.1 with triethanolamine (*8*). The cation exchange capacity (sum) was determined by the distillation of adsorbed ammonia after extraction with sodium chloride (*8*).

Clay mineralogy reported in table 12 was determined by L. J. Johnson of the Pennsylvania Agricultural Experiment Station, Pennsylvania State University. The clay minerals were identified by means of a Norelco X-ray Spectrometer, equipped with a copper target, Geiger counter, and chart recorder, on samples (less than 0.002 millimeter) oriented on glass slides. Air-dried, sieved samples were treated with hydrogen peroxide to destroy the organic matter. Iron oxides were removed by treatment with oxalic acid, potassium oxalate, and magnesium ribbon (*3*). The clay was separated by decantation and with a centrifuge. One part of the clay was saturated with potassium, placed on glass slides, and air dried. These slides were heated to 300° C., and an X-ray tracing was made. The slides were then heated to 500° C., and another X-ray tracing was made. Another part of the clay was saturated with magnesium, placed on slides, air dried, and a diffraction tracing was made. These slides were then saturated with ethylene glycol, and another tracing was made. The tracings were interpreted on the basis of peak height and the relationship to known clay mixtures.

## Laboratory Interpretations

Most of the soils that were tested have a surface layer of silt loam. All except the Atkins soil have a textural B horizon. Most have a subsoil that is finer textured than the surface layer. On the average, for this group, the subsoil shows a 17 percent increase in clay over the surface layer. The percentage ranges from 5.7 in the Brinkerton soils to 32.8 in one of the Cavode soils. Coarse fragments are common in the Gilpin and Clymer profiles and in one profile of Wharton silt loam. In all of the other profiles, coarse fragments make up less than 10 percent of the A horizon and of the B horizon.

Bulk density in the surface layer is highest on the coarser textured Clymer soils and in areas of greatest compactness. In the subsoil, bulk density generally increases with depth.

The available moisture capacity of a soil represents the difference, expressed in inches per inch of soil, between the moisture held by cores at tension of one-third atmosphere and the moisture held by fragmented soil at 15 atmospheres tension. The surface layer of the soils sampled holds about 0.2 inch of water per inch of soil. The range is 0.14 to 0.22 inch. The subsoil holds a somewhat lesser amount. Mainly because of coarse fragments, the Ap horizon of the Gilpin and Clymer soils has the lowest available moisture capacity.

Except for the Brinkerton soils, all of the soils sampled are naturally acid. The Brinkerton soils have the highest content of extractable bases and the lowest content of extractable hydrogen in the substratum.

Organic carbon in the Ap horizon ranges from 1.10 to 2.35 percent (1.87 to 4.06 percent organic matter based on the conversion factor of 1.724). The carbon-nitrogen ratios are narrow in cultivated soils. A ratio of 20 for the O2 horizon of Cavode silt loam in woodland is normal.

The cation exchange capacity is chiefly related to the amount and kind of clay and the amount of organic matter in the various horizons. For the finer textured soils, the cation exchange capacity of any horizon below the Ap or A1 horizons is 17 to 23 milliequivalents per 100 grams of soil. For the Clymer and Gilpin soils, the cation exchange capacity of their coarser textured subsoil is less than 14 milliequivalents per 100 grams of soil.

Base saturation is less than 50 percent in all the horizons except the limed Ap horizons and the lowermost horizons of both Brinkerton profiles and one Ernest profile. Base saturation in the Brinkerton and Ernest profiles is higher, probably because permeability is slow and a low position on the landscape has helped to reduce leaching. Furthermore, these soils have received bases in surface and ground water from higher areas.

All of the soils sampled characteristically contain the clay minerals illite and kaolinite. Illite is generally the more abundant of the two and is more prominent in the C horizon than in the A horizon. Kaolinite character-

istically is a fairly well crystallized mineral but, in most profiles, is present in lesser amounts than illite. Kaolinite is either not being formed as a weathering product in these soils or the rate of formation is too slow to produce detectable quantitative differences within a profile by the methods used. Consequently, kaolinite distribution in the profiles is fairly uniform. In addition to illite and kaolinite, all of the soils contain vermiculite and interstratified combinations of two or more of the following: vermiculite, montmorillonite, dioctahedral chlorite, and illite. A few of the soils contain small amounts of discrete montmorillonite and chlorite (trioctahedral type). The A horizon contains the largest amount of vermiculite or montmorillonite interstratified with dioctahedral chlorite (a combination sometimes referred to as intergrade chlorite-vermiculite), or both.

Some of the data reported in tables 11 and 12 are summarized and explained in the following paragraphs by soil series.

Atkins Series.—The B1g horizon of the Atkins soil is coarser texture than the Ap horizon, and it has a higher content of organic matter. The bulk density data indicate that this soil is well aggregated and has considerable pore space in the horizons sampled. Coarse fragments are not abundant enough to influence greatly the physical and chemical properties. Because of the high water table, water is made available to plants by capillary action.

The organic-matter content is high throughout the 16 inches, which accounts for the moderately high cation exchange capacity. Calcium is the dominant extractable cation. This soil is very strongly acid and strongly leached, probably because it formed in very strongly acid and strongly leached alluvium.

No weathering of illite is detectable. Both the A and B horizons contain similar amounts of illite, vermiculite, and interstratified clay minerals. This suite of minerals is very similar to that found in the A horizon of mature soils. Since this is an alluvial soil, the clay mineral distribution may be interpreted as resulting from deposition of A horizon material that eroded from upland soils. This soil is of recent origin, so weathering has not yet affected the clay minerals; and it is on flood plains, which are areas of deposition where weathering is not intense enough to produce a detectable difference in clay mineral composition.

Brinkerton Series.—The first Brinkerton profile, S58Pa32–3 (1–6), has a textural B horizon but the increase in silt and clay in the B horizon over the A horizon is not so great as that in the second Brinkerton profile, S61Pa32–50 (1–7). The bulk density of the first profile below a depth of 29 inches is high enough to restrict root development and to retard water movement. In both profiles, bulk density increases with depth. The available moisture capacity is high, but the shallow root zone somewhat reduces the effect of this high rating.

The organic-matter content is moderately high in the Ap horizon of the first profile and high in the second. The upper part of the B horizon of both profiles is strongly acid or very strongly acid. Liming most likely accounts for the lower acidity of the Ap horizon. Poor drainage probably accounts for the higher content of metallic cations and the lower acidity of the lower part of the B horizon and the C horizon. The high water table restricts the entry of oxygen and lowers the soil temperature and, thus, reduces weathering and leaching.

In both profiles, calcium is the dominant extractable cation in the Ap horizon and the upper part of the B horizon. Magnesium is the dominant extractable cation in the lower part of the B horizon and in the C horizon of the first profile and shares dominance with calcium in the same horizons of the second. The cation exchange capacity is moderately high in both profiles. The high content of organic matter may account for the higher exchange capacity of the uppermost horizons.

Both profiles contain illite and kaolinite. The first profile contains a small amount of discrete montmorillonite and does not have so pronounced a profile of weathering as the second, as is indicated by the relative distribution of illite.

Cavode Series.—Both the first Cavode profile, S58Pa 32–2 (1–9), and the second, S61Pa32–59 (1–6), have a textural B horizon. In the first profile, bulk density below a depth of 28 inches is high enough to restrict root development and retard water movement. The Cavode soils have a moderately high or high available moisture capacity; but when their shallow root zone is considered, the available moisture capacity logically is reduced.

The organic-matter content is moderately high in both profiles. In the first, calcium is the dominant extractable metallic cation in the O2 horizon, and magnesium is dominant in the lower part of the B horizon and in the C horizon. The extractable cation and base saturation data show that the first profile is very strongly acid and strongly leached; the A2 and B1 horizons are the most strongly leached; the base cycle accounts for the higher content of calcium and potassium in the O2 horizon; and weathering and leaching is least severe in the lower part of the B horizon and in the C horizon.

In the first profile, the moderately high cation exchange capacity of the lower part of the B horizon and of the C horizon is due to the higher content of clay. The moderately high content of organic matter in the A horizon and the fairly high content of clay in the upper part of the B horizon probably accounts for the higher exchange capacity in the other profile.

Clymer Series.—Both Clymer profiles are very strongly acid except where limed, are strongly leached, and have a low supply of bases. Both have a textural B horizon, but this horizon is more evident in the second Clymer profile, S61Pa32–58 (1–5), than in the first, S61Pa32–55 (1–6). A fairly high content of sand in both profiles most likely accounts for the relatively high bulk density shown for these soils. Coarse fragments are abundant enough to strongly affect the available moisture capacity and the capacity for retaining plant nutrients. The laboratory data indicate that Clymer soils have a moderately low available moisture capacity, but the deep root zone of these soils helps to increase this capacity to moderate.

The Clymer profiles contain a moderate amount of organic matter in the Ap horizon. Calcium is the dominant extractable metallic cation. Liming followed by leaching probably accounts for the dominance of this cation. The cation exchange capacity is moderately low or low.

In both profiles, the kaolinite is about equal in amount to illite. The profiles of weathering are very well developed.

Ernest Series.—The first Ernest profile, S58Pa32-1 (1-9), contains a low supply of exchangeable bases. It is more strongly acid and more strongly leached of bases than the second Ernest profile, S61Pa32-51 (1-5).

In both profiles, a textural B horizon is well expressed, and bulk density increases with depth. The coarse fragments in the profiles have little effect on soil properties, although the second profile contains many fragments and concretions. Laboratory data indicate that the Ernest soils have a high available moisture capacity, but the moderately deep to shallow root zone can reduce this capacity to moderately high.

The organic-matter content is fairly high in the surface layer of both profiles. Calcium is the dominant metallic cation in the A horizon and in the upper part of the B horizon of both profiles. Magnesium is dominant in the lower part of the B horizon and in the C horizon of the first profile; and calcium and magnesium share dominance in the same horizons of the second profile. The cation exchange capacity is moderate in the A2 and A3 horizons and moderately high in the A1 and B horizons of the first profile. A lower content of organic matter than that in the A1 horizon and a lower content of clay than that in the B horizon probably account for the lower cation exchange capacity of the A2 and A3 horizons. The cation exchange capacity is moderately high in the second profile.

Both profiles contain the typical clay mineral suite and have moderately developed profiles of weathering.

Gilpin Series.—The neutral Ap horizon and the slightly acid B1 horizon of the first Gilpin profile, S61Pa32-54 (1-6), and the medium-acid Ap horizon of the second Gilpin profile, S61Pa32-56 (1-4), reflect the use of lime and fertilizer. The textural B horizon of both profiles is more sharply defined at the upper boundary than the lower one. The much higher content of coarse fragments in the skeletal C horizon is a more important criteria for separating the B and C horizons than the texture, especially in the second profile. Bulk density typically increases with depth in both profiles. In the second profile, bulk density is slightly higher in the B1 horizon than in the B2 horizon because finer textured material moves down from the Ap horizon and fills the larger pores of the B1 horizon. Coarse fragments make up a significant part of the Gilpin profiles; they are most abundant in the Ap and C horizons. The available moisture capacity is moderately low because of the fairly high content of coarse fragments.

The organic-matter content is high in the Ap horizon of the first profile and moderately low in the second. Moderate erosion most likely accounts for the lower content of organic matter in the Ap horizon of the second profile. Calcium is the dominant extractable metallic cation in both profiles, and the cation exchange capacity is moderate or moderately low. The moderately low content of clay in these soils is one factor that reduces their ability to hold moisture and plant nutrients.

Both profiles contain the typical clay mineral suite, and both have a moderately developed profile of weathering. The kaolinite content is about equal in amount to the illite content, which may be a reflection of the sandstone influence in these soils.

Wharton Series.—Both Wharton profiles have a well-defined textural B horizon; and in both, bulk density increases with depth. The bulk density data indicate that the Ap horizon in both profiles is well aggregated and that the C horizon is dense enough to restrict root development and retard water movement. Coarse fragments make up a significant part of the first Wharton profile, S61Pa32-53 (1-6), and are prominent in the B3g and C1g horizons of the second Wharton profile, S61Pa32-57 (1-5). The fragments in the Ap and B1 horizons of the first profile are small pieces of sandstone that apparently moved down from an adjacent slope. The fragments in the lower part of the B horizon and in the C horizon of both profiles are mainly small pieces of weathered shale. The available moisture capacity is moderately high for the first profile and high for the second.

The Ap horizon, in both profiles, is high in content of organic matter. Calcium is the dominant extractable metallic cation in the Ap horizon and in the upper part of the B horizon in both profiles, and magnesium is dominant in the lower part of the B horizon and in the C horizon. The cation exchange capacity is moderate or moderately high. It is somewhat higher in the second profile, probably because this profile contains more clay and has more organic matter throughout the solum than the first.

Wharton soils are characterized by the typical clay mineral suite, and they have a well developed weathering profile.

## *General Nature of the County*

Indiana County was established in 1803 from parts of Lycoming and Westmoreland Counties. It was named after the original inhabitants, the Indians. The first white settlers were Scotch-Irish who had migrated from counties in the eastern part of the State. Later came Germans and Welsh. A large number of immigrants settled in the county, largely because of the coal industry. These immigrants were principally from Italy, Poland, Austria, and the Slavic countries.

The population of Indiana County has steadily declined from a maximum of nearly 90,000 in 1920 to slightly more than 75,000 in 1960, according to reports published by the U.S. Bureau of Census. In 1960, about 28 percent of the population was concentrated in cities and towns.

U.S. Highways No. 22, No. 422, and No. 119 and State Highways No. 286, No. 85, and No. 56 run through Indiana County. Also, there are many miles of secondary roads.

About 48 percent of the county is covered with second- and third-growth hardwoods, 14 percent is idle or is in urban use, and the rest is cropland or pasture (*9*). Dewberry, huckleberry, goldenrod, poverty grass, laurel, and saplings of red maple and white pine are common on much of the idle land and in pastures in the eastern and northern parts of the county. Dewberry, povertygrass, ticklegrass, sassafras, thornbushes, and dogwood are common in the western part; and bluegrass, black locust, and black cherry are common in the southwest.

Indiana County is moderately well supplied with ground water (*6*). Dug wells are still in use but are gradually being replaced by drilled wells. Small springs are numerous and in many places provide water for domestic use. Some of the smaller towns obtain all or part of their water from springs. About half the towns

in the county that have a public water-supply system are dependent on ground water. The larger towns utilize surface water.

## Agriculture

Largely because of economic changes, the number and size of farms in the county have steadily declined. According to the latest agriculture census, about 2,000 farms are operating in the county, and the average size of a farm is 122 acres. The total acreage taken up by farms is 245,800 acres.

Although the number of acres farmed has decreased, production per acre has increased and has more than offset the loss in production from the reduced acreage. Increased use of lime and fertilizer in recent years has helped to compensate for the low natural fertility of many soils in the county.

Table 13 lists the acreage in the county that was planted to important crops in 1962. The statistics were submitted by the Pennsylvania Crop Reporting Service. Hay, oats, corn, and wheat have always been the principal crops in Indiana County, and they account for most of the farmed acreage. The acreage planted to buckwheat, rye, and potatoes has steadily decreased to almost insignificant amounts. Rye and buckwheat were grown principally because, on many farms, the soils were too poor for other grains. Most of the potatoes are now grown on a few large farms.

TABLE 13.—*Acreage of principal crops in 1962*

| Crop | Acres |
|---|---|
| Corn, total | 16,800 |
| For grain | 12,400 |
| For silage | 4,400 |
| Small grains harvested: | |
| Wheat | 5,600 |
| Oats | 15,500 |
| Barley | 1,500 |
| Hay crops, total | 40,800 |
| Alfalfa | 16,400 |
| Clover, timothy, and mixtures of clover and grasses | 21,900 |
| Other hay cut | 2,500 |
| White potatoes | 550 |

In 1962, there were approximately 25,000 apple trees of bearing age in the county, and approximately 1,300 peach trees.

Livestock and livestock products, particularly dairy products, are more important as a source of income in Indiana County than crops. Although the number of livestock decreased from 1954 to 1959, the income received from livestock and livestock products increased. In 1959 the census of livestock in the county showed the following:

| | *Number* |
|---|---|
| Cattle and calves | 28,587 |
| Cows, including heifers that have calved | 14,676 |
| Milk cows | 12,061 |
| Heifers and heifer calves | 9,765 |
| Steers and bulls, including calves | 4,146 |
| Horses and mules | 924 |
| Hogs and pigs | 11,356 |
| Chickens | 198,112 |
| Sheep and lambs | 4,960 |

## Climate [6]

The humid, continental climate of Indiana County is characterized by warm summers and cold winters. Precipitation is adequate and normally well distributed. Winds prevailingly are from the west and bring most of the major pressure systems that affect this area. Air currents are mainly from the polar region, but during the summer, invasions of air from the Gulf of Mexico are frequent and result in warm, humid weather. Similar invasions in winter are less frequent and account for the alternate periods of freezing and thawing.

The weather in Indiana County is variable. During winter and spring, noticeable changes occur daily, but during summer and fall such changes are less frequent. At times, primarily from June through October, the weather remains essentially the same for as long as 10 days. During these periods, days are hot and humid in summer and nights are warm. In fall these periods of unchanging weather are generally mild and dry. One or more of these periods can be expected each year, though in some years heat is not excessive. From December through February, cold spells that last 5 to 10 days are common. Brisk northwesterly winds prevail during the coldest periods.

Because elevation and slope differ markedly within short distances, there are local differences in climate within the county. Temperatures, on the average, are slightly higher and rainfall is somewhat less in the valleys than at higher elevations. Freezing temperatures occur later in spring and earlier in fall in the valleys; the growing season, consequently, is somewhat shorter in the valleys. Windspeeds, also affected by relief, are less near the ground.

Data on temperature and precipitation for Indiana County are given in table 14. These data and the climatic discussion in the following paragraphs are based on records at the Indiana weather station, which is at an elevation of 1,102 feet.

The average annual temperature ranges from 49° F. in the northern part of the county and at the higher elevations in the southern part to 52° in the southwestern part. The monthly average temperature ranges from 29° in January to 71° in July, although departures from these averages in any given year are the rule rather than the exception. During an extended period of unusually cold or warm weather, the monthly departure from normal may be as much as 10°, particularly during December through March, and the daily departure may be even greater. The lowest temperature reported in the county is −25°, and the highest 106°.

Temperatures of 90° or higher normally occur on an average of 11 days per year from June through Septem-

[6] By NELSON M. KAUFFMAN, State climatologist, U.S. Weather Bureau, Harrisburg, Pa.

TABLE 14.—*Temperature and precipitation for Indiana County*

[All data from records at Indiana, Pa.]

| Month | Temperature | | | | Precipitation | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | One year in 10 will have— | | Snow | | |
| | Average daily maximum | Average daily minimum | Average extreme maximum | Average extreme minimum | Average total | Less than— | More than— | Average total | Average number of days with depth of— | |
| | | | | | | | | | 1 inch or more | 6 inches or more |
| | *°F.* | *°F.* | *°F.* | *°F.* | *Inches* | *Inches* | *Inches* | *Inches* | *Number* | *Number* |
| January | 37 | 20 | 59 | −4 | 3.0 | 1.8 | 5.2 | 8.5 | 13 | 3 |
| February | 40 | 20 | 62 | −3 | 3.0 | 1.7 | 4.2 | 9.8 | 11 | 4 |
| March | 48 | 29 | 72 | 10 | 3.9 | 1.8 | 5.8 | 7.7 | 5 | 2 |
| April | 62 | 38 | 81 | 21 | 4.2 | 2.3 | 5.6 | 1.2 | ([1]) | 0 |
| May | 72 | 46 | 86 | 29 | 4.3 | 2.1 | 7.9 | 0 | 0 | 0 |
| June | 80 | 55 | 91 | 41 | 4.7 | 2.0 | 8.4 | 0 | 0 | 0 |
| July | 83 | 59 | 92 | 45 | 4.7 | 2.4 | 6.8 | 0 | 0 | 0 |
| August | 82 | 57 | 91 | 43 | 3.8 | .9 | 8.0 | 0 | 0 | 0 |
| September | 76 | 51 | 89 | 33 | 3.5 | 1.2 | 7.6 | 0 | 0 | 0 |
| October | 63 | 41 | 81 | 25 | 3.0 | 1.4 | 6.4 | .2 | ([1]) | 0 |
| November | 51 | 33 | 71 | 14 | 3.3 | 1.4 | 5.3 | 3.4 | 2 | ([1]) |
| December | 39 | 21 | 60 | −1 | 2.9 | 1.6 | 4.7 | 11.3 | 12 | 3 |
| Annual | 61 | 39 | [2] 96 | [3] −25 | 44.3 | 20.6 | 75.9 | 43.1 | 43 | 12 |

[1] Less than half a day.
[2] Highest maximum during 1941–63.
[3] Lowest minimum during 1941–63.

ber. Occasionally a temperature of 90° is reported in April and as late as mid-September. Temperatures of 100° or higher occur about once every 12 years. At higher elevations in southern and eastern areas, temperatures remain somewhat lower and climb above 90° on an average of only once in July and once in August. Temperatures of 0° or lower occur throughout the county on about 8 days from December through March. During extremely cold winters, however, temperatures below 0° have been reported on as many as 20 days, and temperatures below the freezing mark on 45 to 60 days.

Daily variations in temperature are generally 15 to 20 degrees in winter and 24 to 30 degrees in summer. Pronounced changes in temperature within a short period are rare, but at times in winter and early in spring rapidly moving cold air causes a drop in temperature of 30 to 40 degrees within 12 hours or less. Noticeable warming trends are considerably more gradual.

The interval between the last 32° temperature in spring and the first in fall is generally considered the growing season. The average length of the growing season in Indiana County is 148 days—May 10 to October 5. The shortest season on record at Indiana is 115 days, and the longest is 191 days. Because of the variation, the data in table 15 are of particular value in determining the probable risk of frost damage to crops. Probabilities of freezes after specified dates in spring and before specified dates in fall are given in this table. For example, a temperature of 32° or lower probably will occur after May 29 in 1 year in 10; and a temperature of 16° or lower probably will occur before November 25 in 5 years in 10. The data in table 15 can be applied to areas in the county that are similar to Indiana in elevation and air drainage. In bowl-shaped valleys and other areas of poor air drainage, regardless of elevation, freezing temperatures are likely to occur earlier in fall and later in spring than at Indiana. At higher elevations, particularly in the southern and eastern parts, altitude tends to counteract the good air drainage, and here freezing temperatures also occur earlier in fall and later in spring than at Indiana.

Ordinarily, precipitation in Indiana County is adequate for farm, industrial, and home use. Annual precipitation ranges from 48 inches in the southern part to 41 inches elsewhere in the county. The difference in precipitation between the wettest months, June and July, and the driest month, December, is generally less than 2 inches. Variations, however, are considerable from month to month and within a month. In the period of record, monthly precipitation has ranged from less than half an inch to slightly more than 10 inches. About 60 percent of the annual precipitation falls during April through September.

Snowfalls are frequent and sometimes heavy from about mid-November to mid-March. In March heavy wet snow may damage trees, utility lines, and other exposed objects. At Indiana, the total monthly snowfall has been 22 to 28 inches in each of the months from December through March and more than 6 inches in April and November. Snowfall is generally greatest in December. Annual snowfall throughout the county ranges, on the average, from slightly less than 40 inches in the northern and western parts to 50 inches near the eastern border and nearly 80 inches at the higher elevations in southern areas. Total snowfall in a season has ranged from only 21 inches at Indiana to 131 inches near Blairsville. The

TABLE 15.—*Probabilities of last freezing temperature in spring and first in fall at Indiana, Pa.*

| Probability | Dates for given probability and temperature | | | | |
|---|---|---|---|---|---|
| | 16° F. or lower | 20° F. or lower | 24° F. or lower | 28° F. or lower | 32° F. or lower |
| Spring: | | | | | |
| 1 year in 10 later than | April 14 | April 20 | April 27 | May 11 | May 29 |
| 2 years in 10 later than | March 31 | April 14 | April 19 | May 5 | May 23 |
| 5 years in 10 later than | March 17 | April 3 | April 11 | April 24 | May 10 |
| Fall: | | | | | |
| 1 year in 10 earlier than | November 6 | October 23 | October 10 | September 21 | September 17 |
| 2 years in 10 earlier than | November 14 | November 2 | October 19 | September 30 | September 22 |
| 5 years in 10 earlier than | November 25 | November 16 | November 1 | October 14 | October 5 |

ground generally is covered with snow for about three-fourths of the winter. Average depth is 10 to 12 inches but is 18 inches or more at some higher elevations.

Thunderstorms number about 35 every year. They can occur in any month, but they occur most frequently from May through August. The heavy rains that accompany the more severe storms cause damage to both plants and soils. Some thunderstorms in spring and summer are accompanied by hail and strong winds. The hail seldom causes extensive damage. Wind gusts of 50 to 60 miles per hour have been recorded.

## Relief, Drainage, and Geology

Indiana County is located on the Allegheny Plateau. It has mature topography and is minutely dissected by numerous small streams (*6*). The most prominent topographical feature in the county is the Chestnut Ridge. This broad hilly belt lies mainly in the central and southern parts of the county, and rises several hundred feet above the general elevation of the county; its crest is 1,600 to 2,000 feet above sea level (*7*). The Chestnut Ridge is a continuation of the great anticline in Westmoreland and Fayette Counties to the south.

The Chestnut Ridge roughly divides the county into two broad land patterns. East of the Ridge, the county is characterized by elevations that range from 1,500 to 1,900 feet; distinct, dipping bedrock strata; and plateau-like topography that includes some broad flats and steep valley slopes, especially along the larger streams. West of the Ridge, the county is characterized by smooth rolling and hilly areas consisting of ridges, broad divides, flat saddles, and rounded hills; and essentially horizontal bedrock strata. The elevation in the western part ranges from 1,200 to 1,500 feet; a few knobs are at an elevation of 1,600 feet or more.

Most of the county is drained westward by tributaries of the Allegheny River. The northeastern part, however, is drained by the headwaters of the West Branch of the Susquehanna River (*6*). The streams east of the Chestnut Ridge, in general, are more active and have deep, narrow channels. On the west side of the Ridge, bottoms or terraces, or both, have formed in most places. The bottoms may be a few feet wide, and the terraces a mile wide or more.

In Indiana County, soils on the uplands formed in place by the disintegration and decomposition of local rocks. Some soils formed in materials that were moved downhill by gravity, soil creep, frost action, or local erosion. The remaining soils formed in materials deposited by streams.

All bedrock exposed in the county is of sedimentary origin (*6*). It was deposited in nearly horizontal beds or strata, but in the eastern part of the county it was later bent and folded, and anticlines and synclines were formed. The total column of exposed rock in the county amounts to about 2,060 feet; it includes 870 feet of rock of the Mississippian period and 1,190 feet of rock of the Pennsylvanian period (*7*). The geologic formations of these periods are discussed in the following paragraphs, beginning with the youngest rocks.

*Monongahela Formation.*—This formation covers about 18 square miles in the county. It contains beds of limestone, calcareous shale, olive-drab shale, and sandstone; its base is the Pittsburgh coal bed. The hills around West Lebanon, Elders Ridge, and Nowrytown in the southwestern part of the county are principally of this formation. The Westmoreland, Guernsey, and Gilpin soils commonly cover most of these hills. Some Dekalb and Ramsey soils have formed in the massive sandstone that overlies the Pittsburgh coal bed.

*Conemaugh Formation.*—This formation consists of the geologic materials between the base of the Pittsburgh coal and the top of the Upper Freeport coal. It is about 600 to 700 feet thick and is the most extensively exposed formation in the county. It is composed largely of olive-drab and reddish shale and sandstone mixed with minor beds of red and gray clay shale and thin limestone and coal. The four principal sandstone beds—Connellsville, Morgantown, Saltsburg, and Mahoning—range from hard, compact, fine textured, and white or buff to friable, coarser textured, and iron stained. The coarser textured sandstone is conglomeritic or full of quartz pebbles. These sandstone beds, within short distances, may be thick massive beds; cross-bedded sandstone; or thin-bedded, shaly sandstone and sandy shale.

The Gilpin and Weikert soils cover most of the Conemaugh formation above the Morgantown sandstone. The Gilpin, Dekalb, and Ramsey soils formed in the Morgantown sandstone. Between the Morgantown sandstone and the Mahoning sandstone are substantial areas of Wharton, Cavode, and Upshur soils, in addition to the Gilpin and Weikert soils. The Saltsburg and Mahoning sandstone beds are extensively exposed in the eastern and northern parts of the county; they are covered mainly by the Dekalb, Clymer, and Cookport soils.

*Allegheny Formation.*—This formation averages 300 feet in thickness and is the second most extensively exposed formation in the county. The top of the Allegheny is marked by Upper Freeport coal; its base is the massive Homewood sandstone. The Allegheny formation is most extensive in the northeastern part of the county and on the Chestnut Ridge but occurs near Blacklick Creek, at the headwaters of Little Yellow Creek, and near McIntyre and Jacksonville. It includes most of the productive coals, the Freeport and Kittanning, in the county. Between the coalbeds are strata of gray-clay shale, olive-drab shale, shaly to massive sandstone, and thin beds of limestone. The Gilpin, Weikert, Wharton, and Cavode soils formed in the upper part of the Allegheny formation; and the Dekalb, Clymer, and Cookport soils formed in the lower part.

*Pottsville Formation.*—This formation crops out only in a few places, mainly on the Chestnut Ridge in West Wheatfield and Burrell Townships. Other areas include the valleys of Yellow Creek, Little Mahoning Creek, and Bear Run. The massive Homewood sandstone is at the top of the Pottsville Formation; and strata of shale, two thin coal beds and accompanying underclay in some places, and massive or thin-bedded sandstone are at the base. Very stony Dekalb soils typically cover most of the upland areas, and very stony Ernest soils are on the lower valley slopes.

*Mauch Chunk Formation.*—These strata are exposed only in the gaps of the Conemaugh River and in the gap of Blacklick Creek east of Josephine. Red and green shale make up the Mauch Chunk formation. The sandy Loyalhanna limestone forms the base of this formation.

*Pocono Formation.*—This formation is mainly sandstone at the top and is practically all covered by floodplain sediment. It is exposed only in Conemaugh River valley, where the river crosses the Chestnut Ridge and the Laurel Ridge anticlines. The outcrops are the oldest in the county.

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## Glossary

**Aeration, soil.** The process by which air and other gases in the soil are renewed. The rate of soil aeration depends largely on the size and number of pores in the soil and on the amount of water clogging the pores; a soil with many large pores is generally well aerated.

**Aggregate, soil.** Many fine soil particles held in a single mass, or cluster, such as a clod, crumb, block, or prism.

**Alluvial soil.** Soil formed from material, such as gravel, sand, silt, or clay, deposited by a stream and showing little or no modification of the original material by soil-forming processes.

**Alluvium.** Fine material, such as sand, silt, or clay, that has been deposited on land by streams.

**Base saturation.** The degree to which soil material is saturated with exchangeable cations other than hydrogen, expressed as a percentage of the cation exchange capacity.

**Bedding, land.** Plowing, grading, or otherwise elevating the surface of a flat field into a series of parallel beds, or "lands," separated by shallow surface drains.

**Bedrock.** The solid rock that underlies the soil and other unconsolidated material or that is exposed at the surface.

**Calcareous.** A soil containing enough calcium carbonate or lime to effervesce (fizz) visibly when treated with cold, dilute hydrochloric acid.

**Cation-exchange capacity.** A measure of the total amount of exchangeable cations that can be held by the soil. It is expressed in terms of milliequivalents per 100 grams of soil. (Formerly called base-exchange capacity.)

**Channery, soil.** A soil that contains thin, flat fragments of sandstone, limestone, or schist as much as 6 inches in length along the longer axis. A single piece is called a fragment.

**Clay.** As a soil separate, the mineral soil particles less than 0.002 millimeter in diameter. As a textural class, soil material that is 40 percent or more clay, less than 45 percent sand, and less than 40 percent silt.

**Claypan.** A compact layer, or horizon, rich in clay and separated more or less abruptly from the overlying horizon.

**Colluvial soil.** Soil formed in material that has been moved by gravity, soil creep, frost action, or local erosion and deposited on lower slopes and at the bases of slopes.

**Concretions.** Hard grains, pellets, or nodules from concentrations of compounds in the soil that cement the soil grains together; the composition of some concretions is unlike that of the surrounding soil; concretions can be of various sizes, shapes, and colors.

**Conglomerate.** Rock composed of gravel and rounded stones cemented together by hardened clay, lime, iron oxide, or silica.

**Consistence, soil.** The feel of the soil and the ease with which a lump can be crushed by the fingers. Terms commonly used to describe consistence are—

*Loose.*—Noncoherent; soil does not hold together in a mass.

*Friable.*—When moist, soil crushes easily under gentle pressure between thumb and forefinger and can be pressed together into a lump.

*Firm.*—When moist, soil crushes under moderate pressure between thumb and forefinger, but resistance is distinctly noticeable.

*Plastic.*—When wet, soil is readily deformed by moderate pressure but can be pressed into a lump; it forms a wire when rolled between thumb and forefinger.

*Sticky.*—When wet, soil adheres to other material; it tends to stretch somewhat and pull apart, rather than pull free from other material.

*Hard.*—When dry, soil is moderately resistant to pressure and is difficult to break between thumb and forefinger.

*Soft.*—When dry, soil breaks into powder or individual grains under very slight pressure.

*Cemented.*—Hard and brittle; little affected by moistening.

**Contour farming.** Field operations, such as plowing, planting, cultivating, and harvesting, kept to a level line at right angles to the direction of the slope, which usually result in a curving furrow.

**Cover crop.** A close-growing crop grown primarily to improve the soil and to protect it between periods of regular crop production; or a crop grown between trees and vines in orchards and vineyards.

**Diversion.** A ridge of earth, generally a terrace, that is built to divert runoff from its natural course and thus, to protect areas downslope from the effects of such runoff.

**Drainage, soil.** (1) The removal of excess surface or ground water from land by means of surface or subsurface drains. (2) The effect of soil characteristics that regulate the ease or rate of natural drainage. Soil is said to be well-drained when the excess water drains away rapidly and poorly drained when the excess water drains away so slowly that it interferes seriously with tillage or plant growth.

**Erosion.** The detachment and movement of the solid material of the land surface by wind, moving water, or ice, and by such processes as landslides and creep.

*Normal* (*geologic*).—The erosion that takes place on the land surface in its natural environment undisturbed by human activity. It includes (1) rock erosion, or erosion of rocks on which there is little or no developed soil, as in stream channels and rocky mountains, and (2) normal soil erosion, or the erosion of the soil under its natural condition, or under native vegetative cover undisturbed by human activity.

*Accelerated.*—Erosion of the soil or rock over and above normal erosion brought about by changes in the natural cover or ground conditions, including changes caused by human activity and those caused by lightning or by the invasion of rodents.

(a) *Sheet*—Removal of a more or less uniform layer of material from the land surface. The effects are less conspicuous than those of other types of erosion that produce large channels. Frequently, in sheet erosion, the eroding surface consists of numerous very small rills.

(b) *Rill*—Erosion by water, which produces small channels that can be obliterated by tillage.

(c) *Gully*—Erosion by water that produces channels larger than rills. Ordinarily, these channels carry water only during and immediately after rains or following the melting of snow. Gullies are deeper than rills and are not obliterated by normal tillage.

**Flood plain.** Nearly level land, consisting of stream sediments, that borders a stream and is subject to flooding unless protected artificially.

**Fragipan.** A compact soil horizon, rich in silt and generally low in clay, that normally has strong, platy structure; it interferes with the penetration of roots and the infiltration of water.

**Graded stripcropping.** Growing crops in strips that are graded toward a protected waterway.

**Grassed waterway.** A natural or constructed waterway, typically broad and shallow and covered by vegetation that protects it from erosion, for the safe disposal of surface water from a field, diversion, terrace, or other structure.

**Horizon, soil.** A layer of soil, approximately parallel to the surface, that has distinct characteristics produced by soil-forming processes and that differs in one or more ways from adjacent horizons in the same profile.

**Lacustrine deposits.** Material deposited from lake water or standing water.

**Loam.** Soil material containing 7 to 27 percent clay, 28 to 50 percent silt, and less than 52 percent sand.

**Mechanical analysis** (soil). The determination of the percentage of soil particles of all sizes—gravels, sands, silts, clays, and all their standard subdivisions—based on the mineral soil only, free of water and organic matter. Particle size refers to the size limits of any particular fraction of the soil, and particle-size distribution refers to the proportions of the various-sized fractions in the whole mineral soil.

**Mottles** (soil). Contrasting color patches that vary in number and size. Descriptive terms are as follows: Contrast—*faint*, *distinct*, and *prominent;* abundance—*few*, *common*, and *many;* and size—*fine*, *medium*, and *coarse*. The size measurements are these: *fine*, less than 5 millimeters (about 0.2 inch) in diameter along the greatest dimension; *medium*, ranging from 5 to 15 millimeters (about 0.2 to 0.6 inch) in diameter along the greatest dimension; and *coarse*, more than 15 millimeters (about 0.6 inch) in diameter along the greatest dimension.

**Parent material.** The weathered rock or partly weathered soil material from which a soil has formed; the C horizon in the soil profile.

**Ped.** An individual natural soil aggregate, such as a crumb, a prism, or a block, in contrast to a clod.

**Permeability, soil.** The quality of a soil horizon that enables water or air to move through it. Terms used to describe permeability are as follows: *very slow*, *slow*, *moderately slow*, *moderate*, *moderately rapid*, *rapid*, and *very rapid*.

**Reaction, soil.** The degree of acidity or alkalinity of a soil, expressed in pH values or in words as follows:

| | *pH* | | *pH* |
|---|---|---|---|
| Extremely acid | Below 4.5 | Mildly alkaline | 7.4 to 7.8 |
| Very strongly acid | 4.5 to 5.0 | Moderately alkaline | 7.9 to 8.4 |
| Strongly acid | 5.1 to 5.5 | Strongly alkaline | 8.5 to 9.0 |
| Medium acid | 5.6 to 6.0 | Very strongly alkaline | 9.1 and higher |
| Slightly acid | 6.1 to 6.5 | | |
| Neutral | 6.6 to 7.3 | | |

**Residual soil.** Soil formed in place by the disintegration and decomposition of rocks and the consequent weathering of the mineral materials. Presumably a soil developed from the same kind of rock as that on which it lies.

**Residuum.** Unconsolidated, partly-weathered material presumed to have been derived from the underlying rock.

**Runoff.** Rainwater that flows away over the surface of the soil without sinking in.

**Sand.** (1) Individual rock or mineral fragments in soils having diameters ranging from 0.05 millimeter to 2.0 millimeters. Usually sand grains consist chiefly of quartz, but they may be of any mineral composition. (2) The textural class name of any soil that contains 85 percent or more of sand and not more than 10 percent of clay.

**Sedimentary rock.** A rock composed of particles deposited from suspension in water. The chief sedimentary rocks are sand stones, shales, limestones, and conglomerates.

**Silt.** (1) Individual mineral particles in a soil that range in diameter between the upper size of clay, 0.002 millimeter, and the lower size of very fine sand, 0.05 millimeter. (2) Soil of the silt textural class contains 80 percent clay.

**Solum.** The upper part of a soil profile, above the parent material, in which the processes of soil formation are active. The solum in mature soils includes the A and B horizons.

**Stripcropping.** Growing crops in a systematic arrangement of strips or bands that serve as vegetative barriers to wind and water erosion.

**Structure, soil.** The arrangement of primary soil particles into compound particles or clusters that are separated from adjoining aggregates and have properties unlike those of an equal mass of unaggregated primary soil particles. The principal forms of soil structure are—*platy*, *prismatic*, *columnar* (prisms with rounded tops), *blocky* (angular or subangular) and *granular*. *Structureless* soils are (1) *single grain* (each grain by

itself, as in dune sand) or (2) *massive* (the particles adhering without any regular cleavage, as in many claypans and hardpans).

**Subsoil.** In many soils, the B horizon; commonly that part of the profile below plow depth.

**Substratum.** Any layer lying beneath the solum, or true soil; the C horizon.

**Terrace** (geological). An old alluvial plain, generally flat or undulating, that borders a stream; frequently called second bottom, as contrasted with flood plain; seldom subject to overflow.

**Terrace** (conservation practice). An embankment, or ridge, constructed across sloping soils on the contour or at a slight angle to the contour.

**Texture, soil.** The relative proportions of sand, silt, and clay particles in a mass of soil. The basic textural classes, in order of increasing proportion of fine particles, are *sand, loamy sand, sandy loam, loam, silt loam, silt, sandy clay loam, clay loam, silty clay loam, sandy clay, silty clay,* and *clay*. The sand, loamy sand, and sandy loam classes may be further divided by specifying "coarse," "fine," or "very fine."

**Tilth, soil.** The physical properties of the soil that affect the ease of cultivating it or its suitability for crops (implies the presence or absence of favorable soil structure).

**Topsoil.** Presumably fertile soil or soil material, ordinarily rich in organic matter, that is used to topdress roadbanks, gardens, parks, and lawns.

**Upland** (geology). Land consisting of material unworked by water in recent geologic time and lying, in general, at a higher elevation than the alluvial plain or stream terrace.

**Water-holding capacity.** The ability of a soil to hold water for plants.

**Water table.** The highest part of the soil or underlying rock material that is wholly saturated with water. In some places an upper, or perched, water table may be separated from a lower one by a dry zone.

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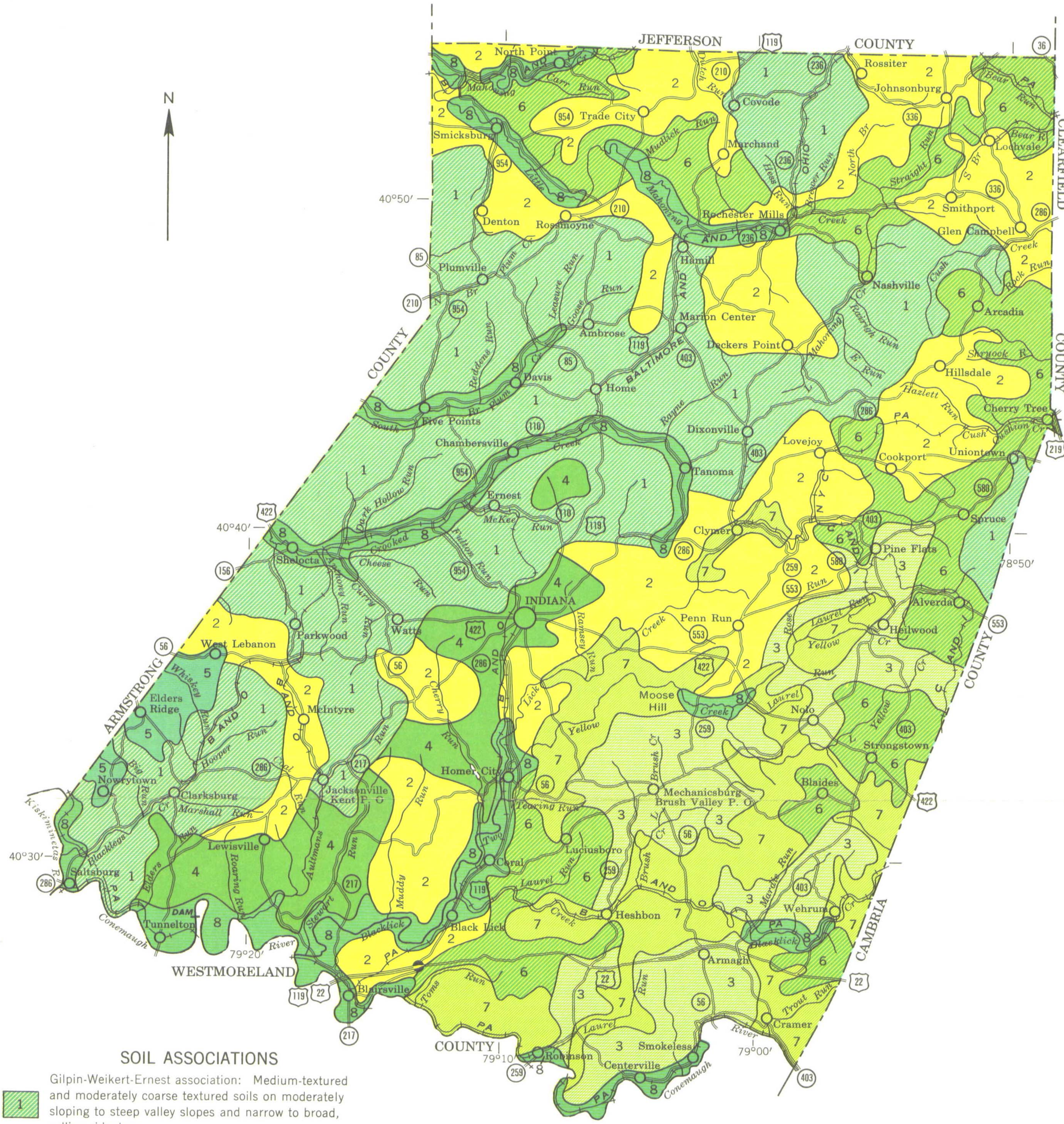



## SOIL ASSOCIATIONS

| | |
|---|---|
| 1 | Gilpin-Weikert-Ernest association: Medium-textured and moderately coarse textured soils on moderately sloping to steep valley slopes and narrow to broad, rolling ridgetops |
| 2 | Gilpin-Wharton-Cavode association: Medium-textured soils on moderately sloping to moderately steep valley slopes and broad, gently sloping hilltops and benches |
| 3 | Gilpin-Clymer-Wharton association: Medium-textured soils on broad, gently sloping and moderately sloping uplands |
| 4 | Gilpin-Wharton-Upshur association: Medium-textured and moderately fine textured soils on broad, gentle uplands; on gently sloping and moderately sloping benches; on moderately sloping to moderately steep hills; and on narrow, rolling hilltops |
| 5 | Gilpin-Westmoreland-Guernsey association: Medium-textured soils on moderately sloping to moderately steep valley slopes, gently sloping benches, and rolling hills |
| 6 | Dekalb-Clymer-Cookport association: Medium-textured and moderately coarse textured soils on steep valley slopes, on ridges, and on broad, gently rolling ridgetops |
| 7 | Dekalb-Clymer-Ernest association: Very stony, medium-textured and moderately coarse textured soils on steep valley slopes, on ridges, and on broad, gently sloping or moderately sloping ridgetops |
| 8 | Monongahela-Allegheny-Pope-Philo association: Medium-textured soils on terraces and flood plains |

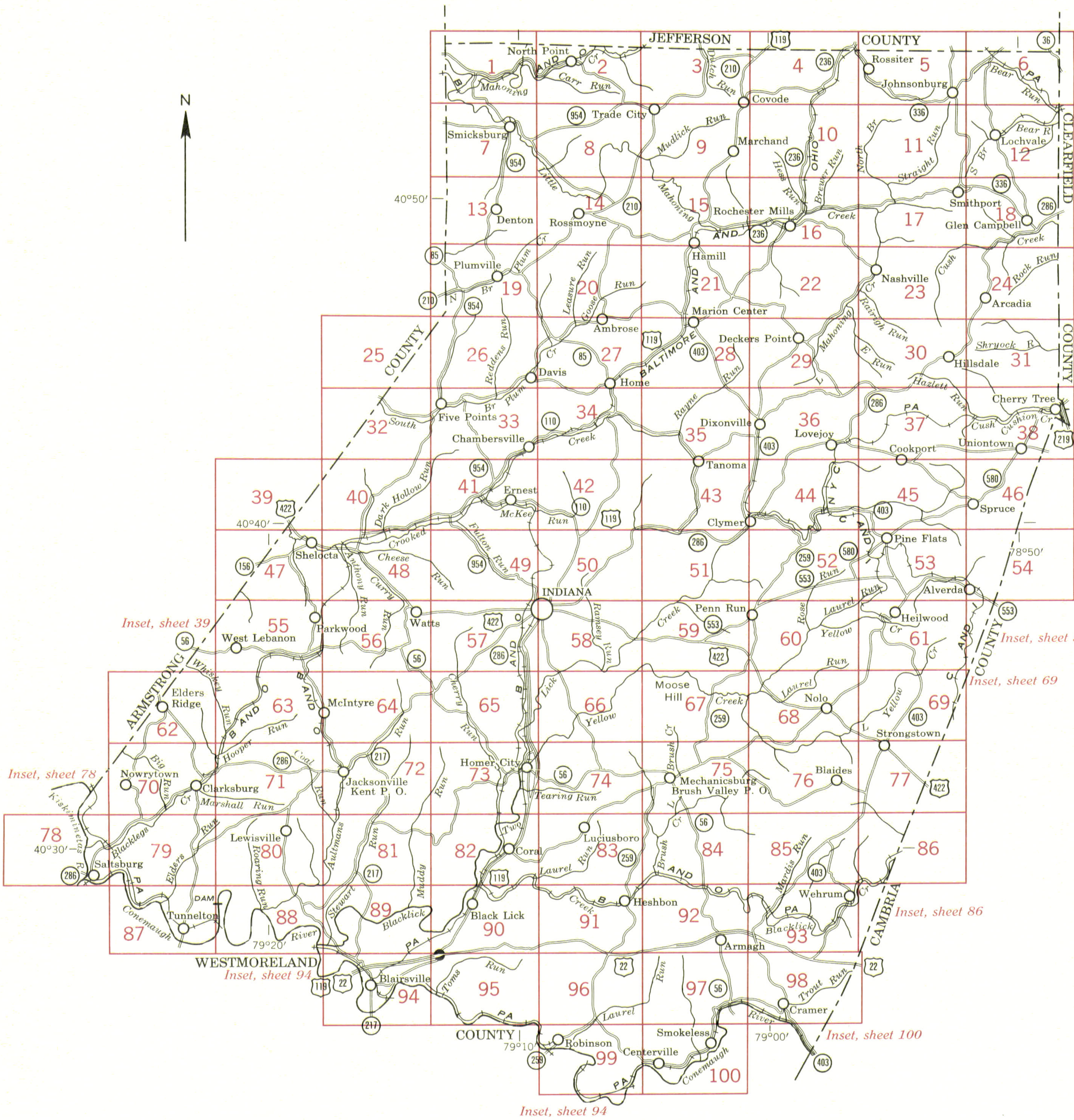
September 1966

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE
PENNSYLVANIA STATE UNIVERSITY
COLLEGE OF AGRICULTURE AND AGRICULTURAL EXPERIMENT STATION
AND THE PENNSYLVANIA DEPARTMENT OF AGRICULTURE
STATE SOIL AND WATER CONSERVATION COMMISSION

# GENERAL SOIL MAP
## INDIANA COUNTY, PENNSYLVANIA

Scale 1:253,440

1 0 1 2 3 4




# INDEX TO MAP SHEETS

## INDIANA COUNTY, PENNSYLVANIA

Scale 1:253,440

1 0 1 2 3 4


0 ½ 1 Mile Scale 1:15 840 0 5000 Feet

This map is one of a set compiled in 1966 as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, the Pennsylvania State University, College of Agriculture and Agricultural Experiment Station, and the Pennsylvania Department of Agriculture State Soil and Water Conservation Commission.

10

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(Joins sheet 9)

(Joins sheet 11)

(Joins sheet 16)

0 ½ 1 Mile

Scale 1:15 840

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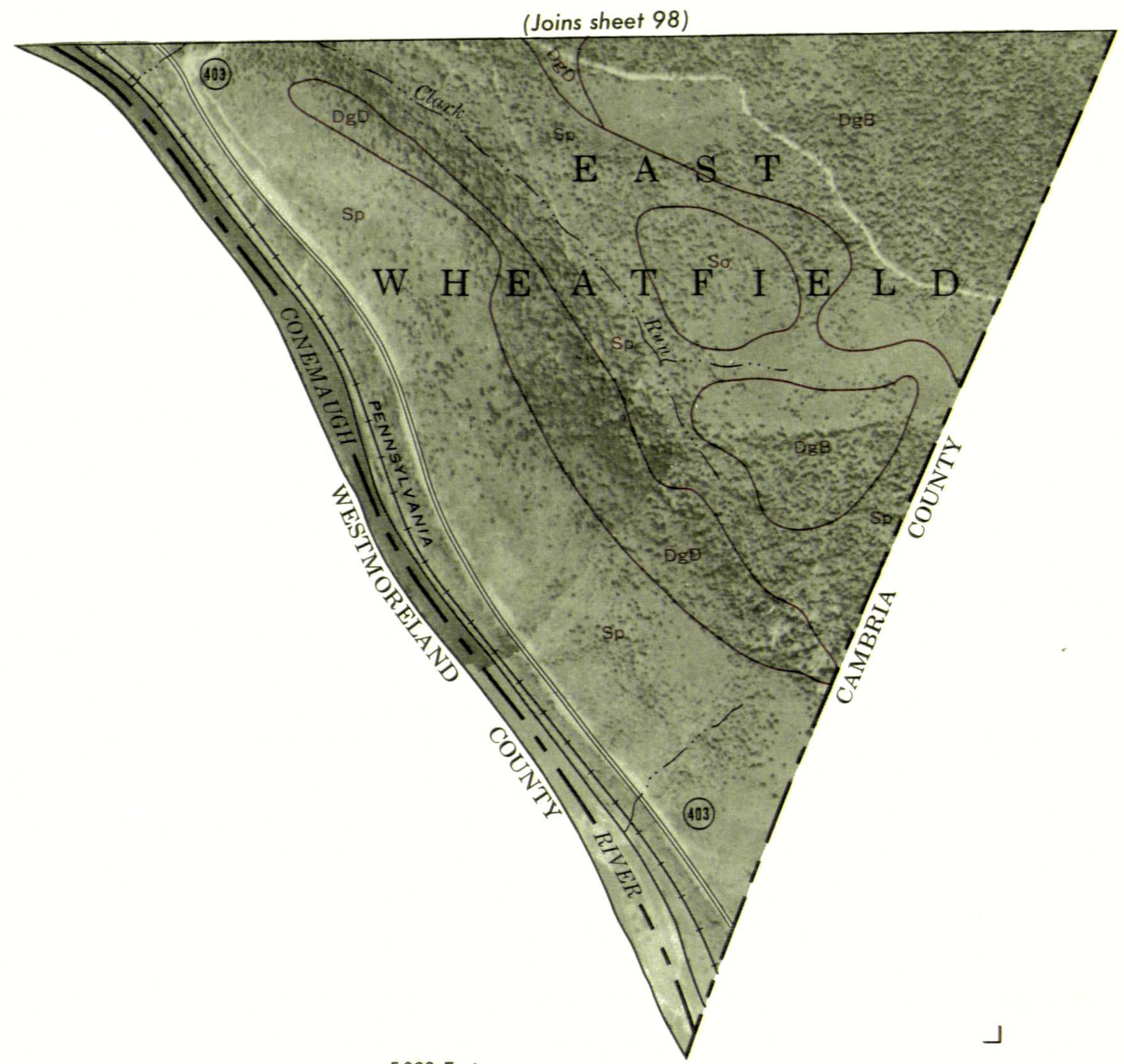


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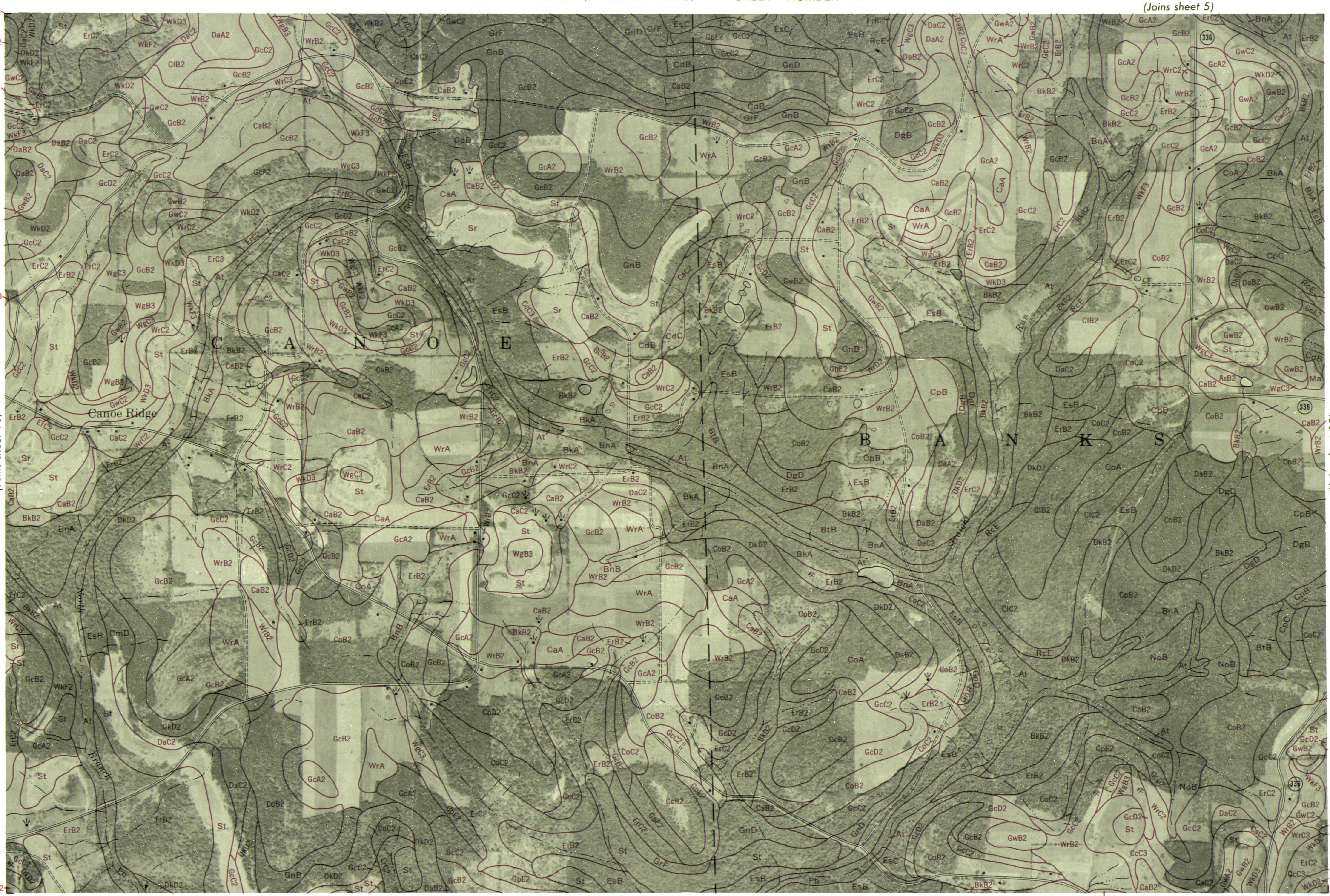


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0 ½ 1 Mile Scale 1:15 840 0 5000 Feet

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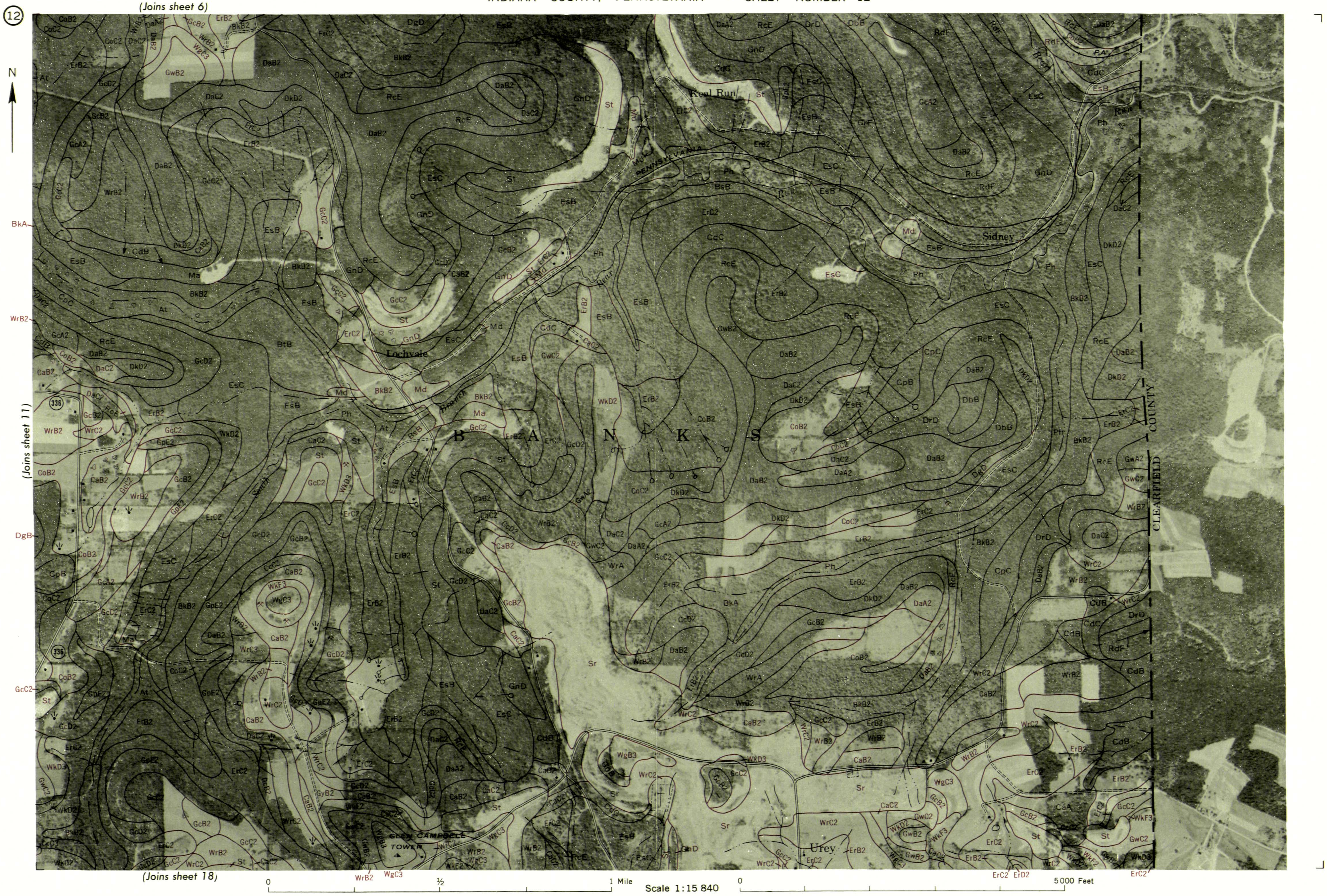

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(Joins sheet 11)
(Joins sheet 18)
N
Keal Run
PENNSYLVANIA
Sidney
Lochvale
B A N K S
CLEARFIELD COUNTY
GLEN CAMPBELL TOWER
Urey
336
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½
1 Mile
Scale 1:15 840
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5000 Feet

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(Joins sheet 19)

0 ½ 1 Mile Scale 1:15 840 0 5000 Feet

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INDIANA COUNTY, PENNSYLVANIA — SHEET NUMBER 14


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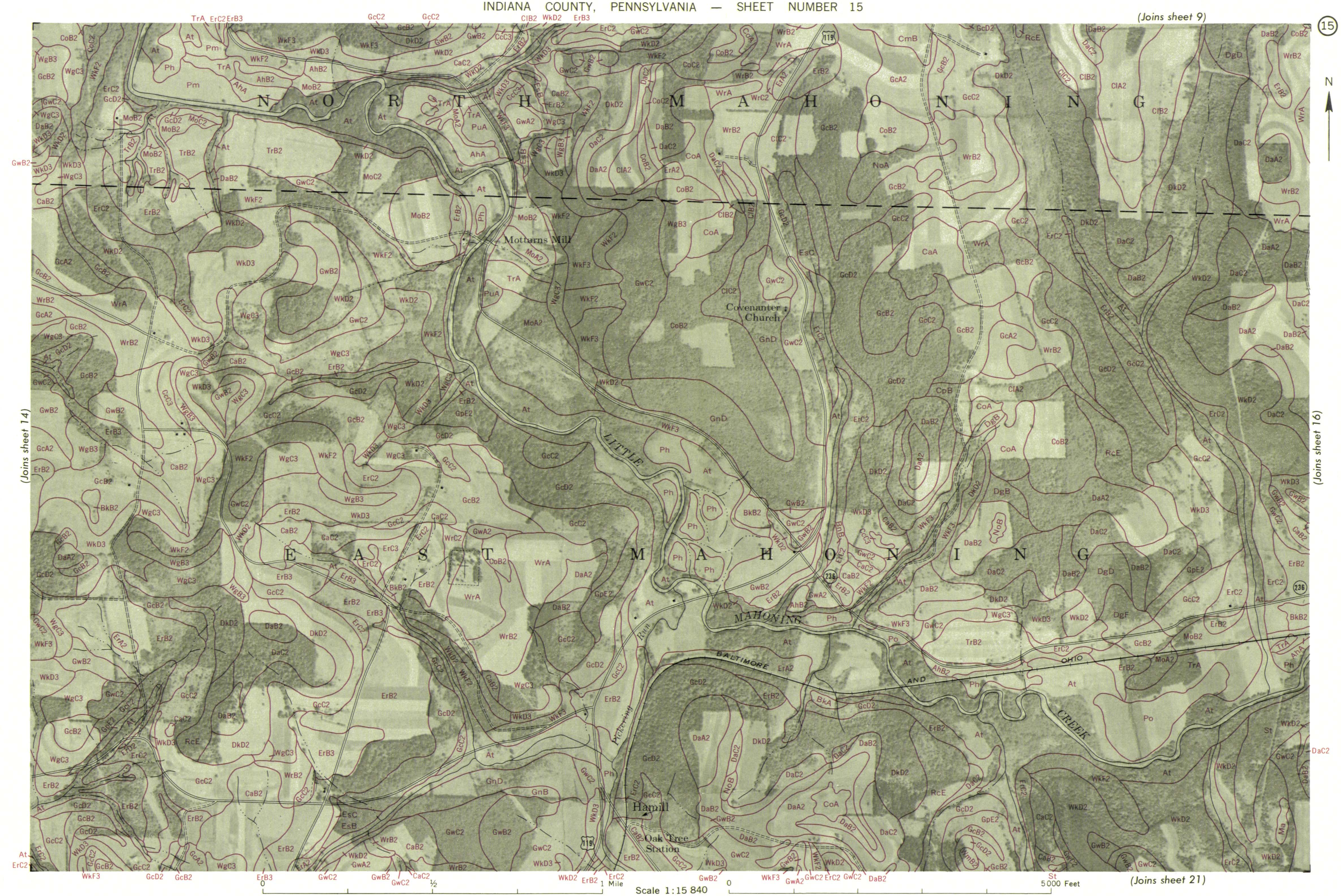


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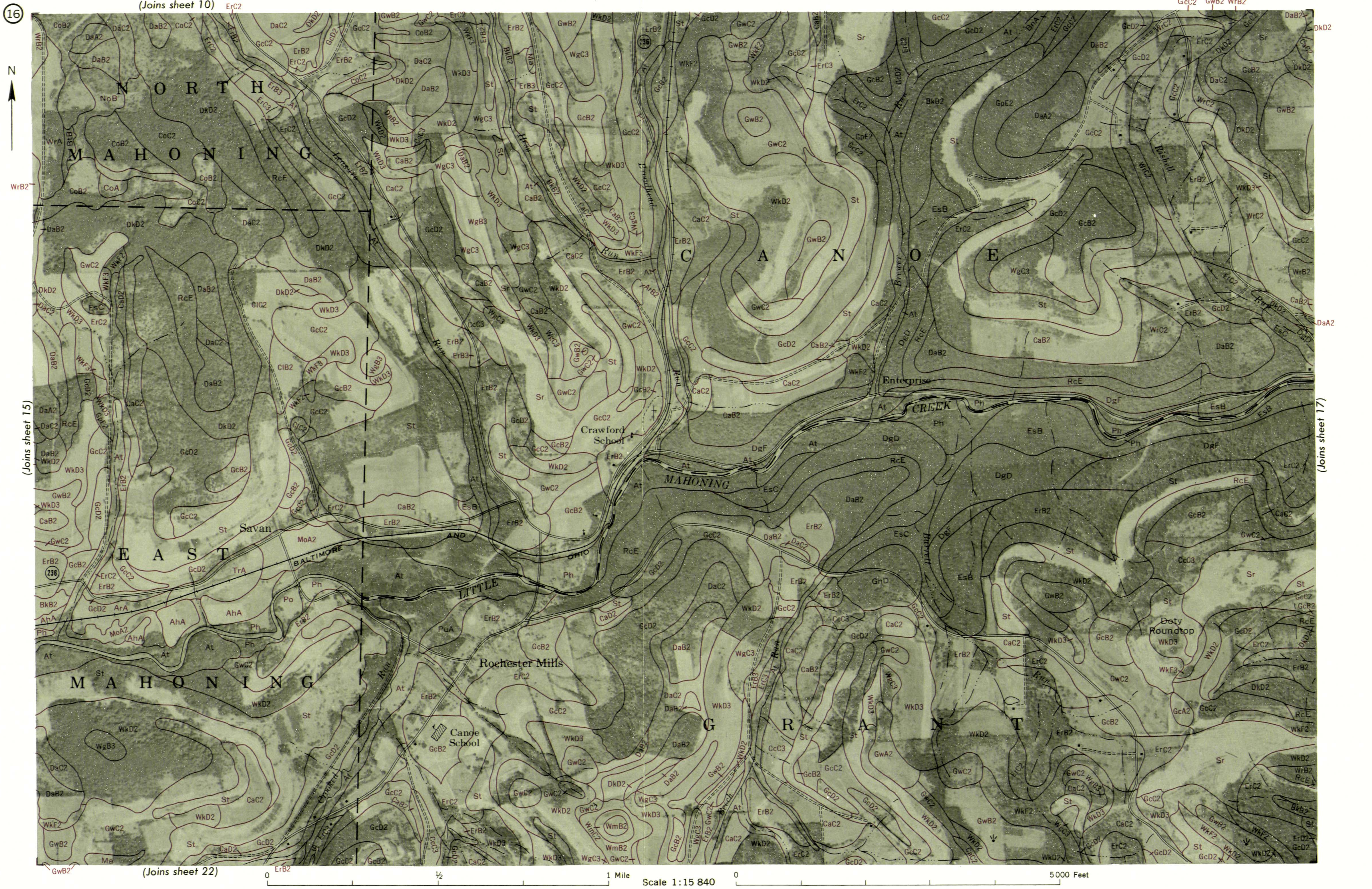
16
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(Joins sheet 17)
(Joins sheet 22)
N
NORTH MAHONING
EAST MAHONING
CANOE
GRANT
Savan
Enterprise
Crawford School
Rochester Mills
Canoe School
Doty Roundtop
MAHONING
CREEK
LITTLE
BALTIMORE AND OHIO
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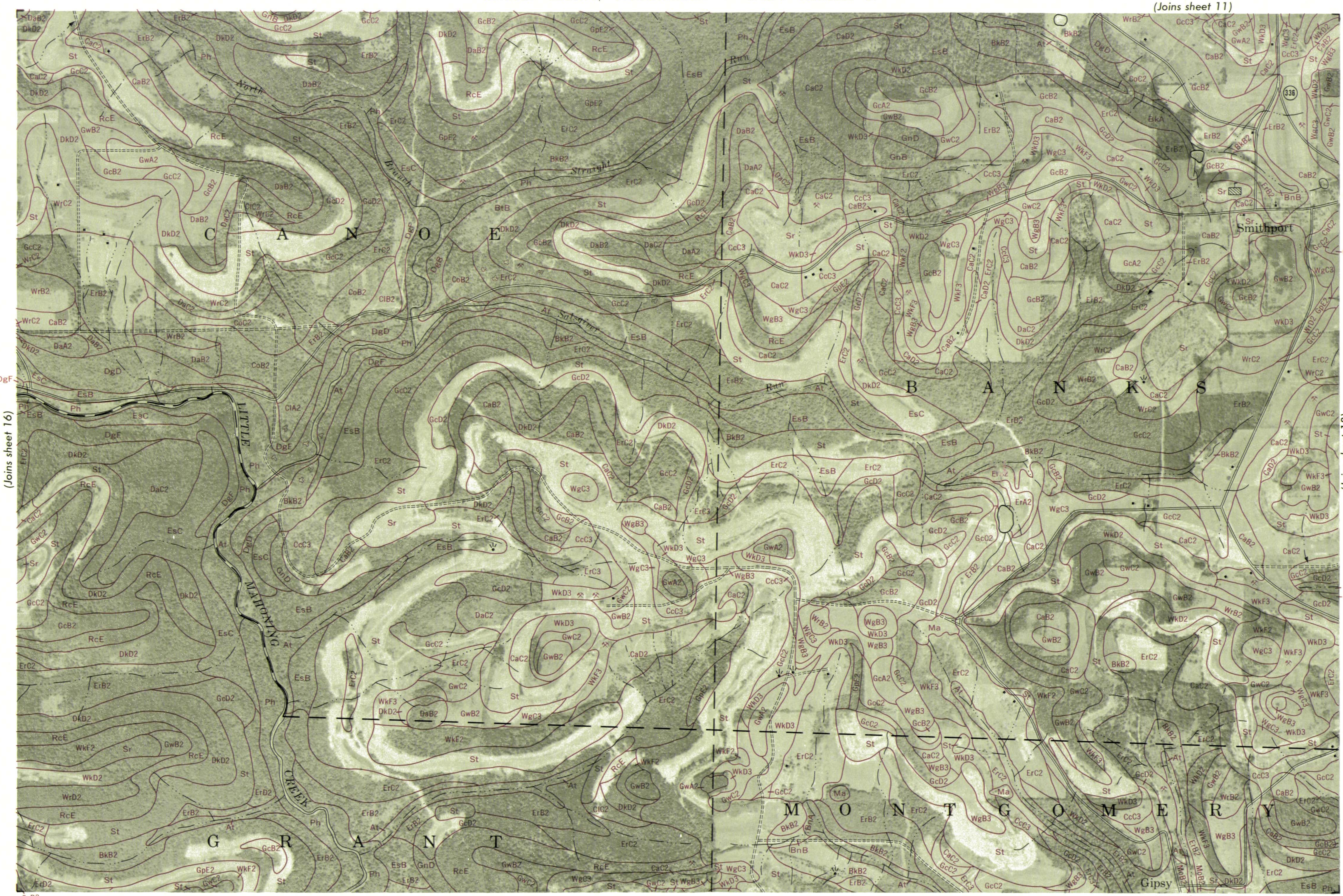
17

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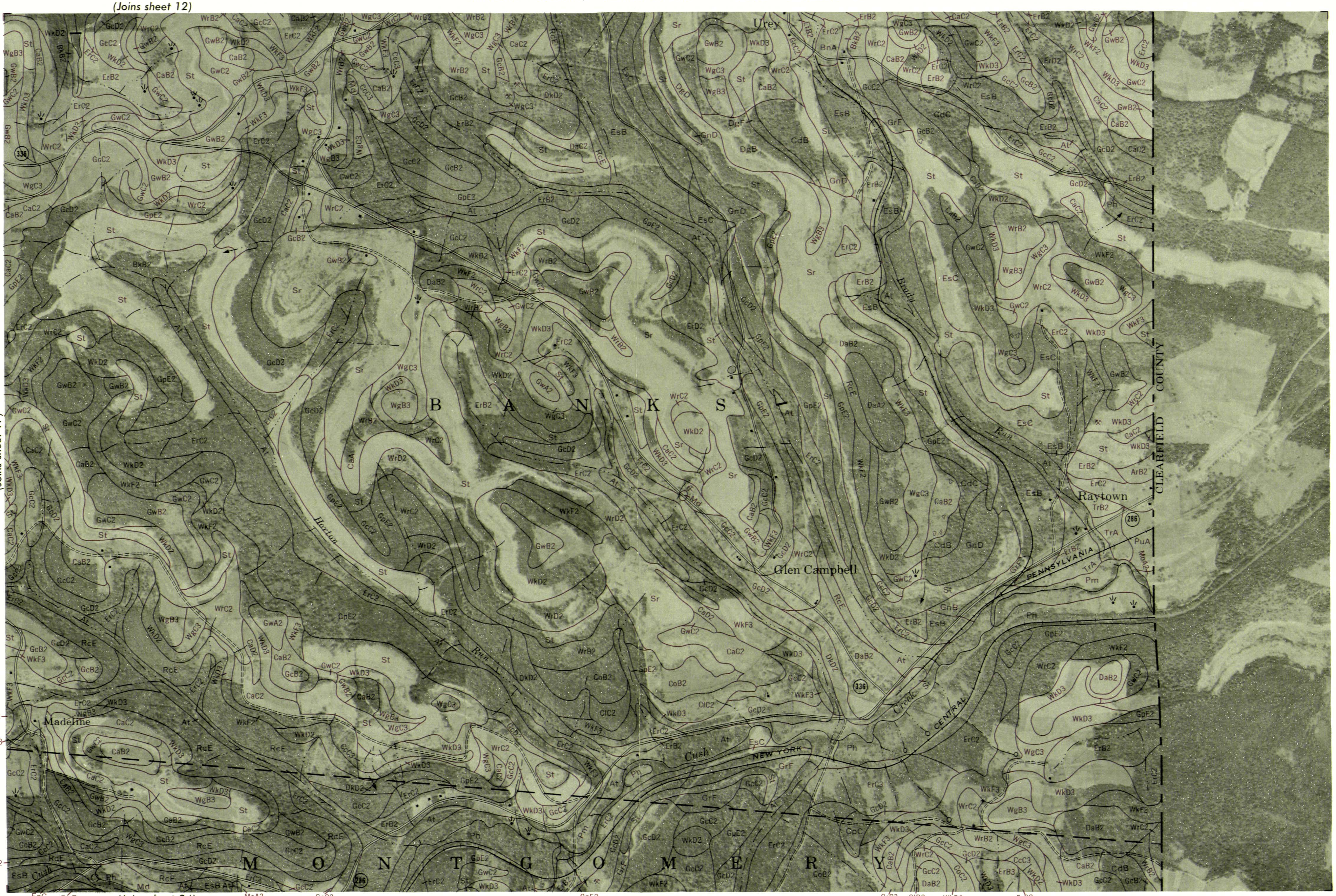


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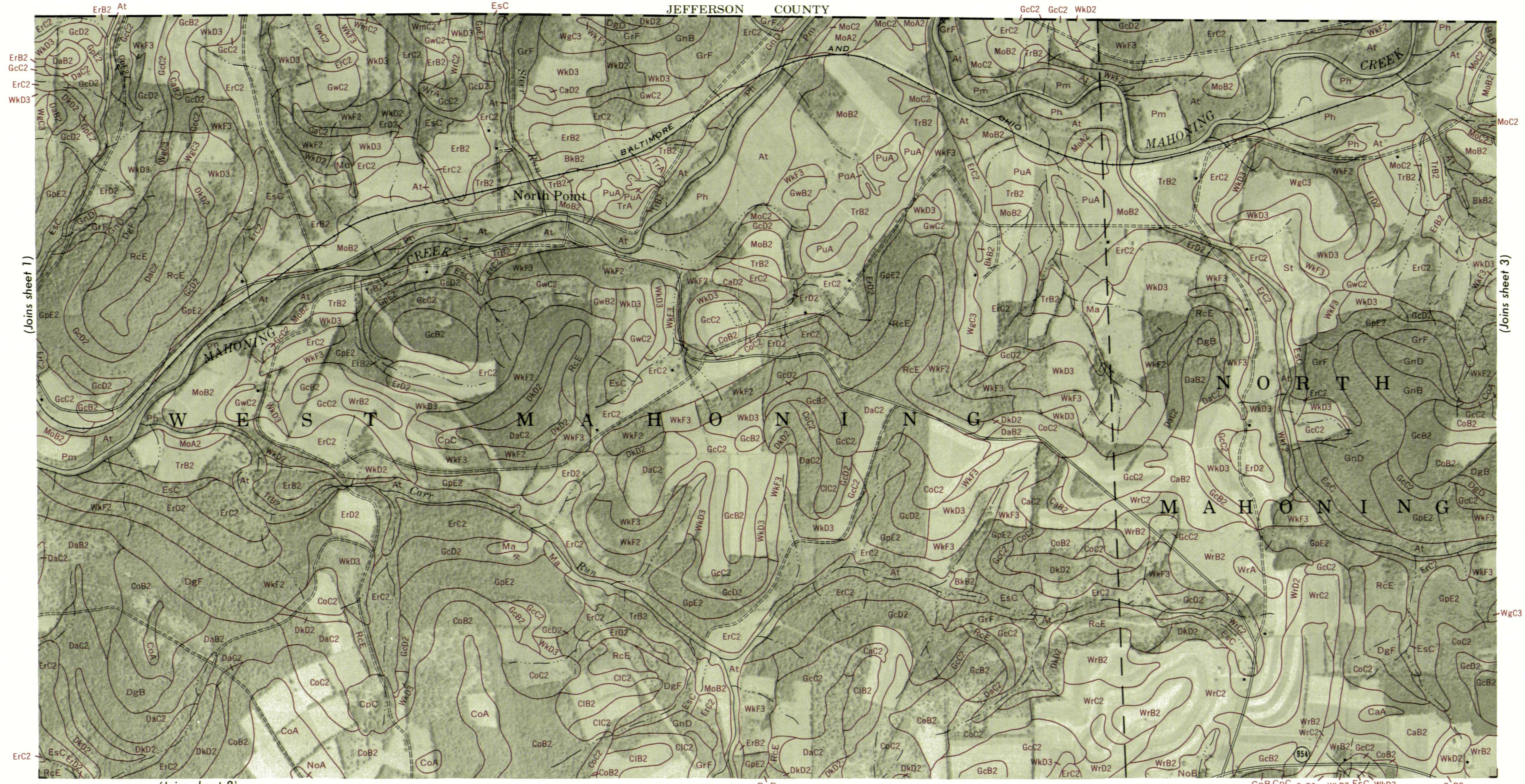


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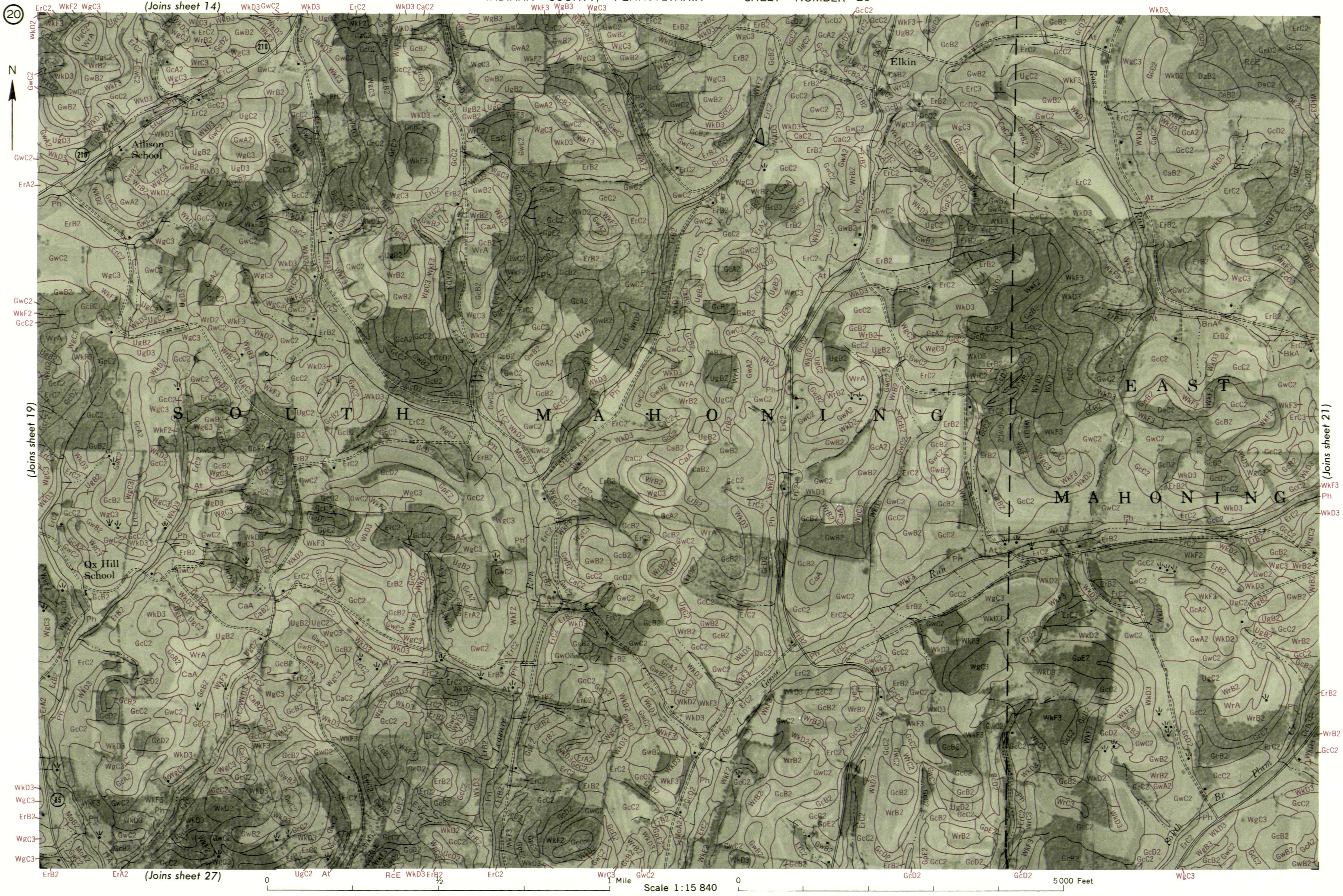
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(Joins sheet 27)
N
Allison School
Ox Hill School
Elkin
S O U T H M A H O N I N G
E A S T M A H O N I N G
Leasure Run
Ross Run
Plum Cr
South Br
Goose Run
0 ½ 1 Mile
Scale 1:15 840
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22
(Joins sheet 16)
(Joins sheet 21)
(Joins sheet 23)
(Joins sheet 29)
N
EAST
MAHONING
GRANT
Pine Vale Church
Mahoning
Creek
Crooked
Run
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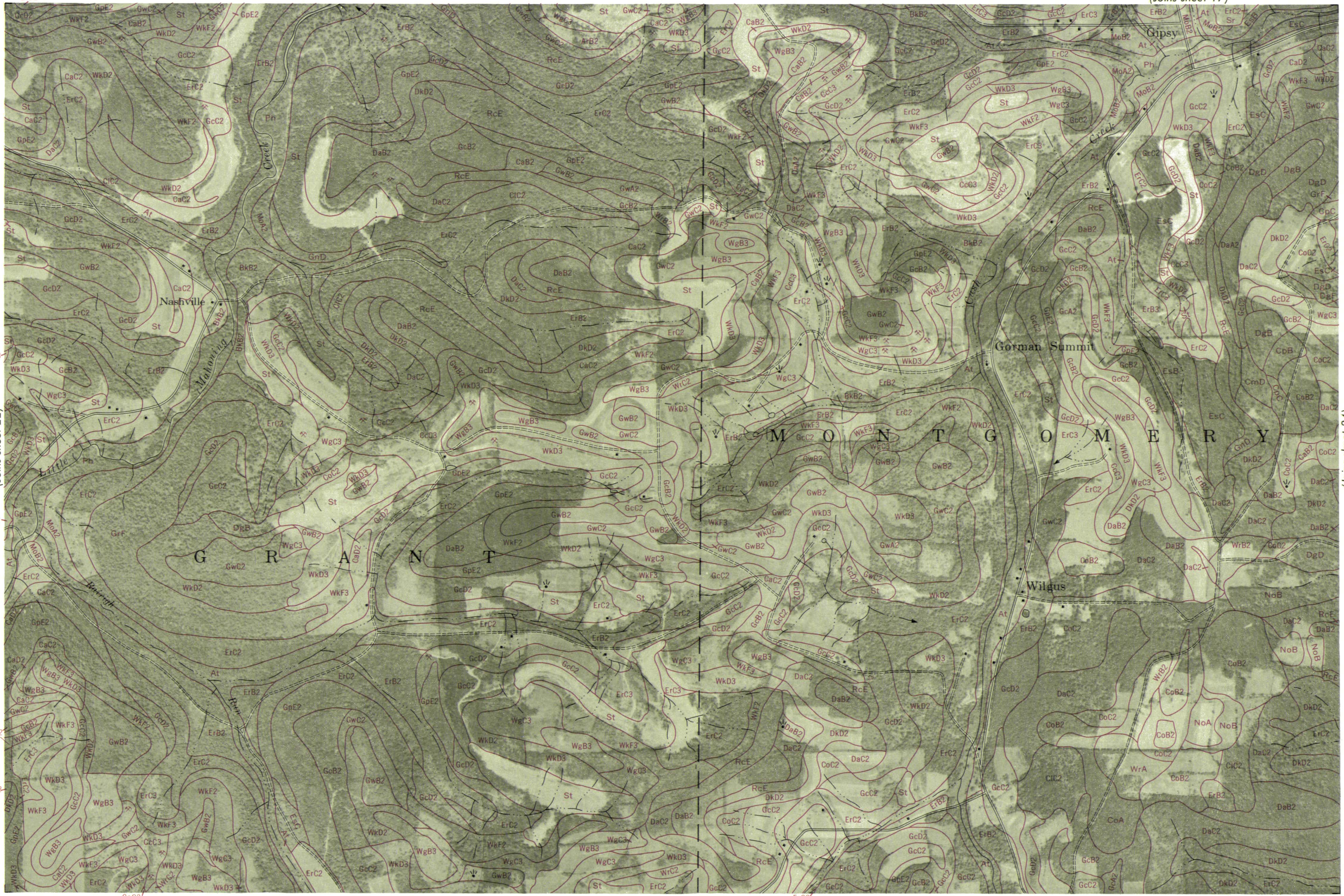


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24

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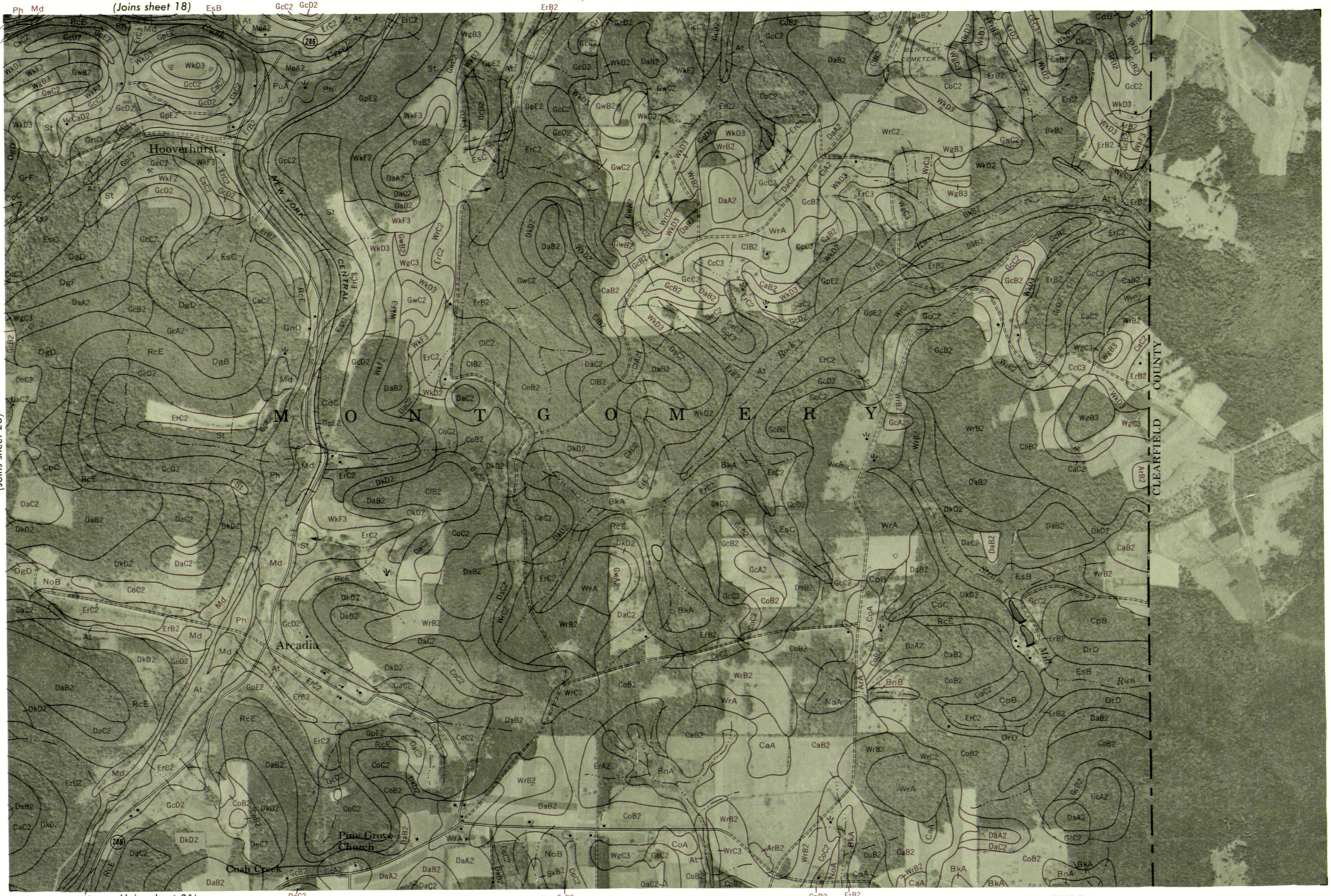


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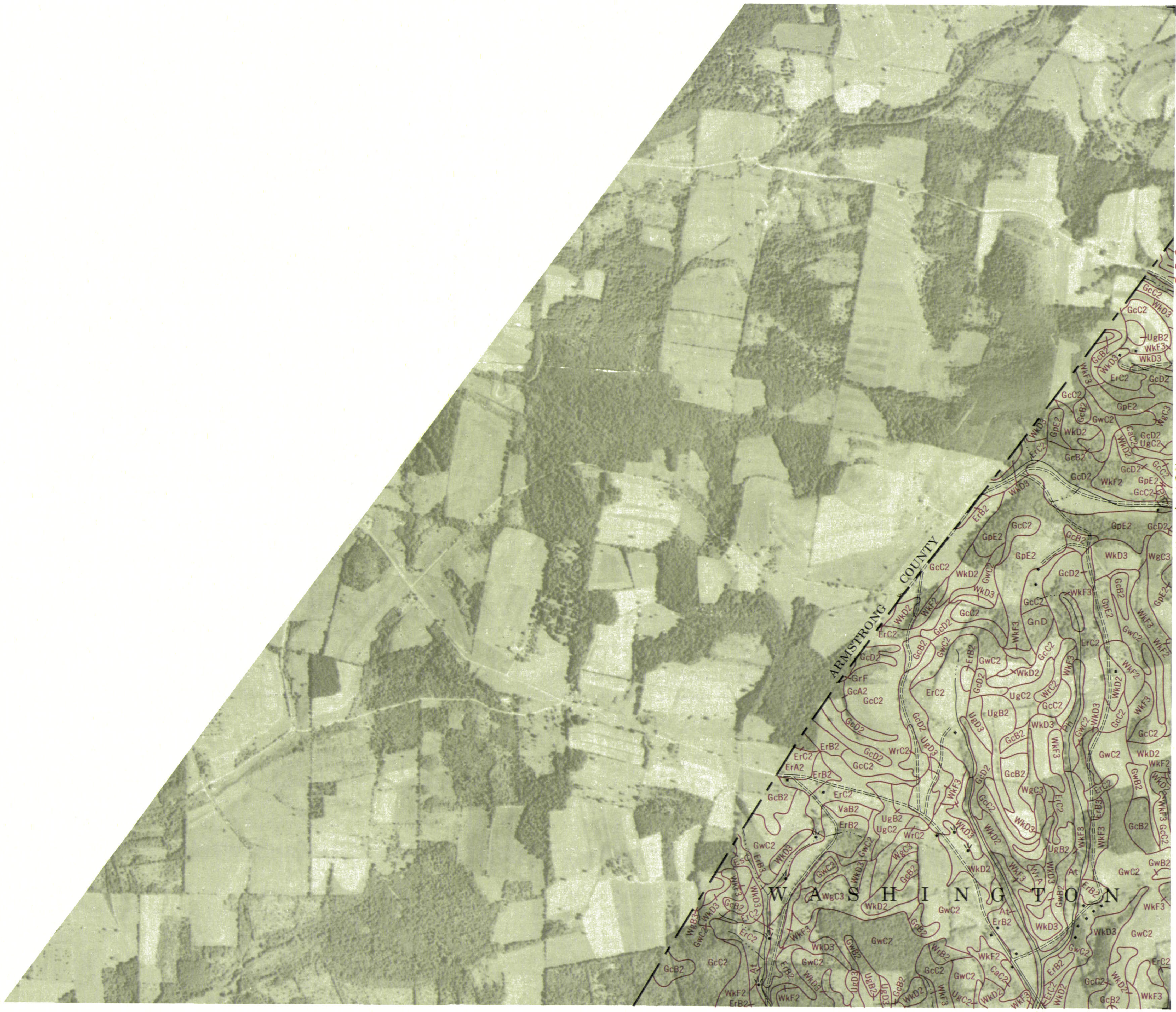


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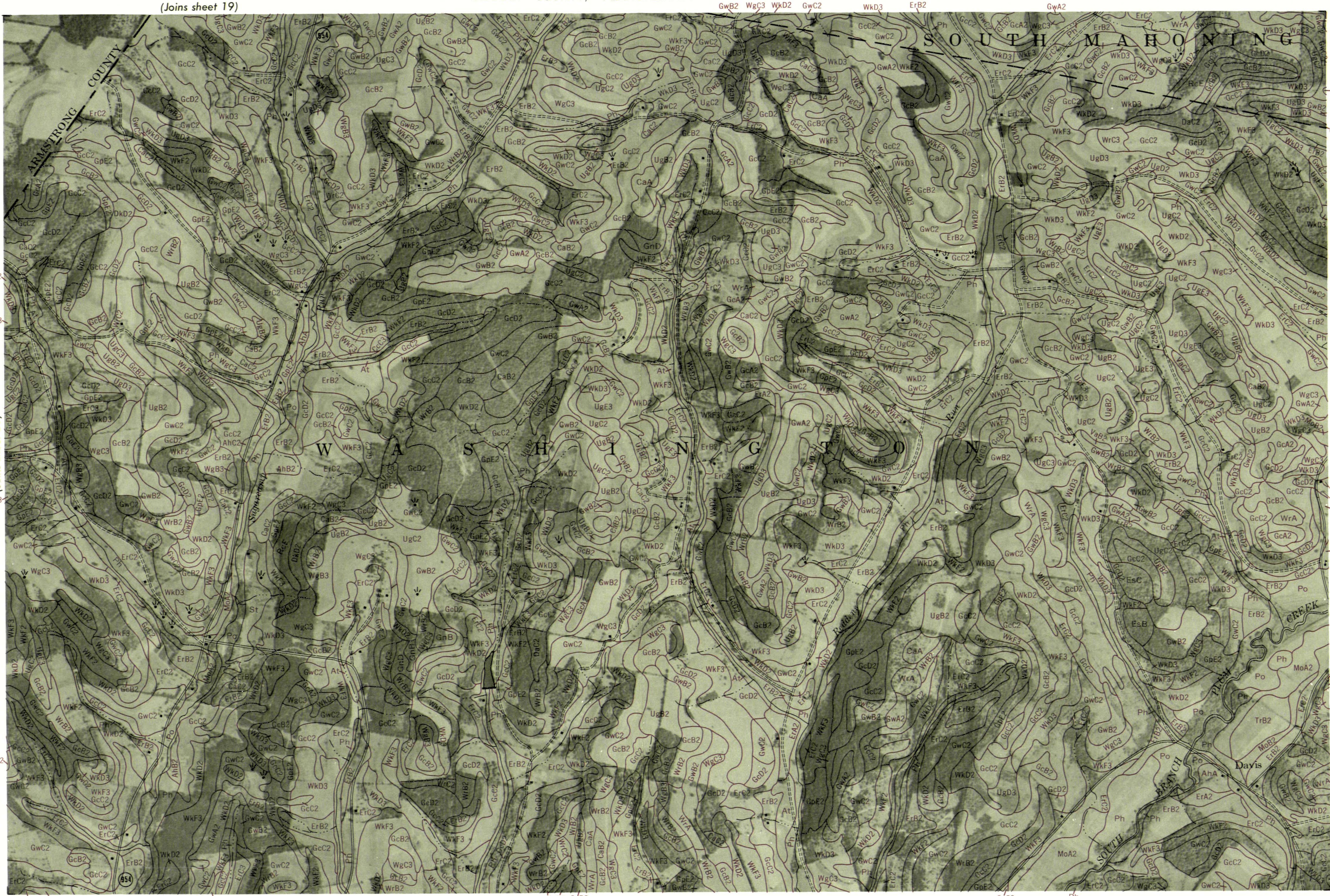


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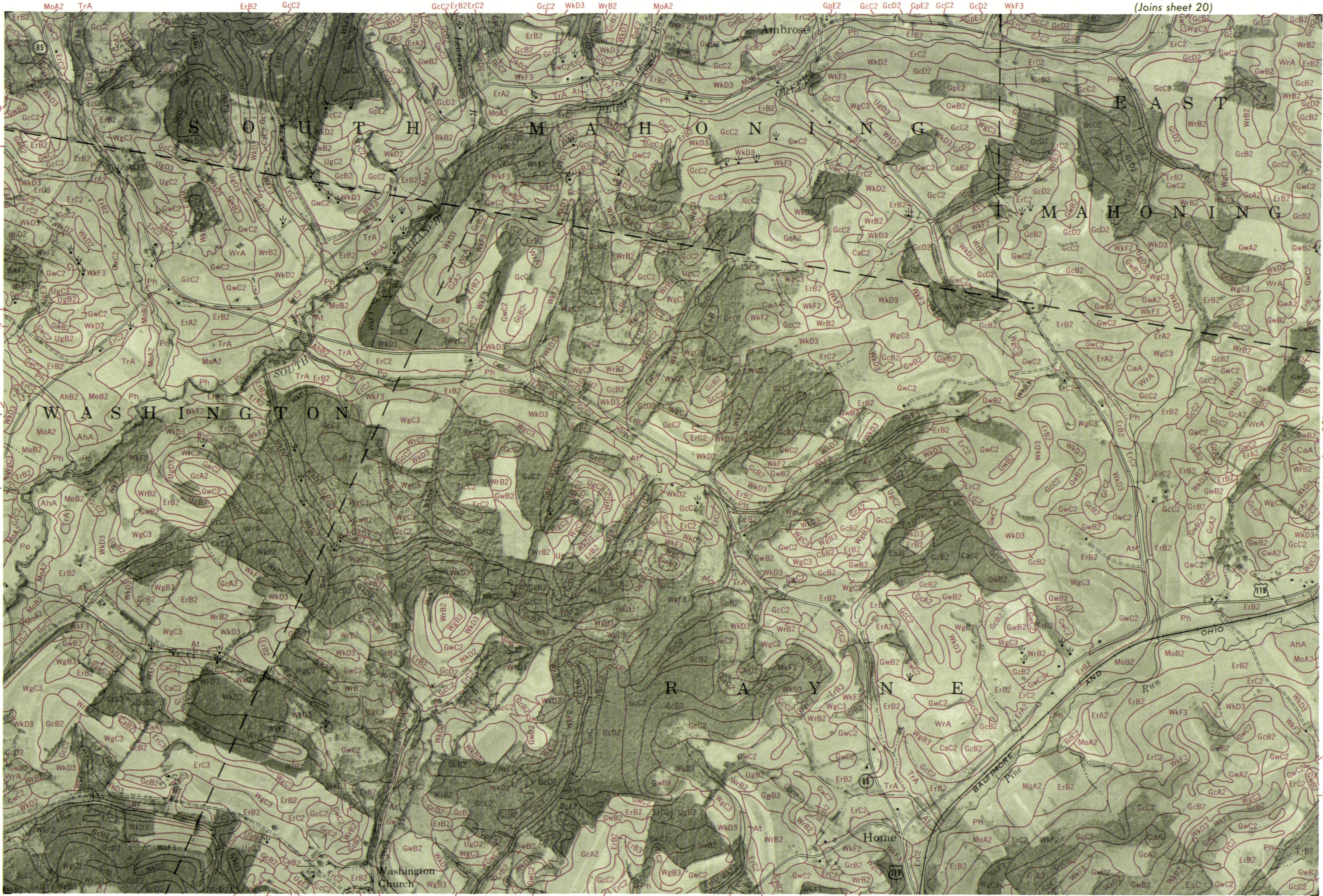


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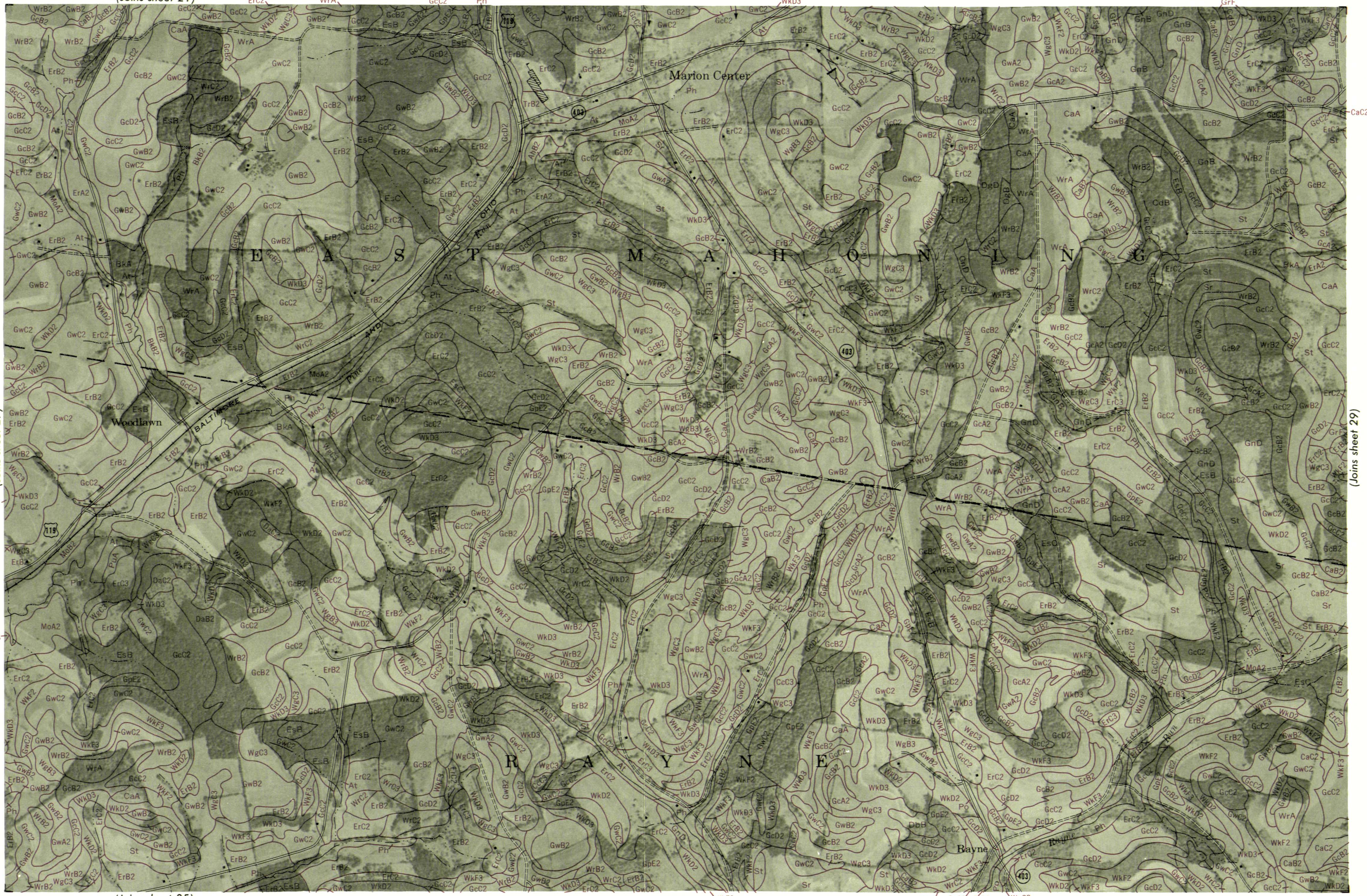
INDIANA COUNTY, PENNSYLVANIA — SHEET NUMBER 28

(Joins sheet 21)



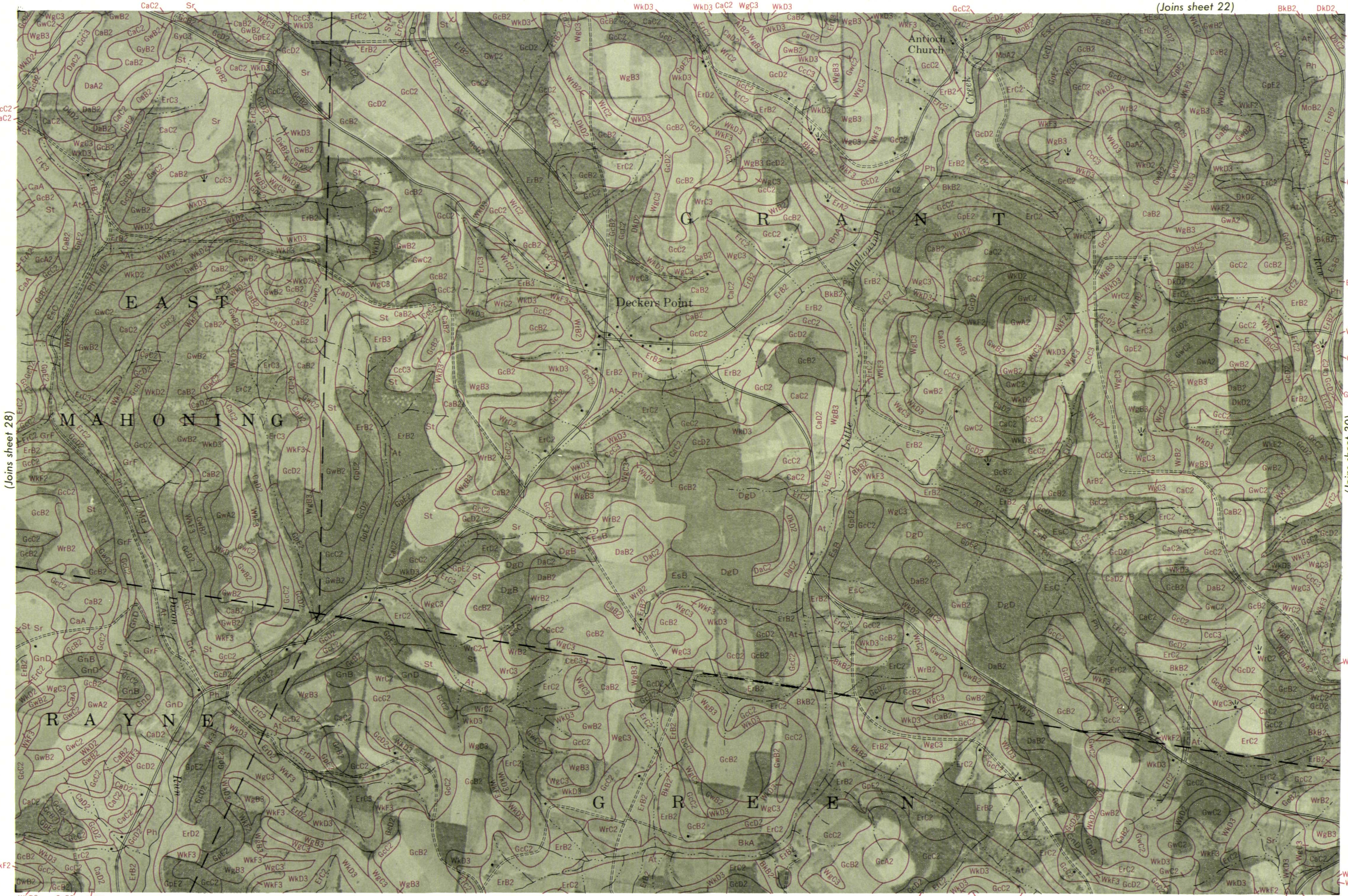

(Joins sheet 35)

0 ½ 1 Mile Scale 1:15 840 0 5000 Feet

29

(Joins sheet 22)

(Joins sheet 28)




(Joins sheet 30)

(Joins sheet 36)

0 ½ 1 Mile Scale 1:15 840 0 5000 Feet

This map is one of a set compiled in 1966 as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, the Pennsylvania State University, College of Agriculture and Agricultural Experiment Station, and the Pennsylvania Department of Agriculture State Soil and Water Conservation Commission.

3

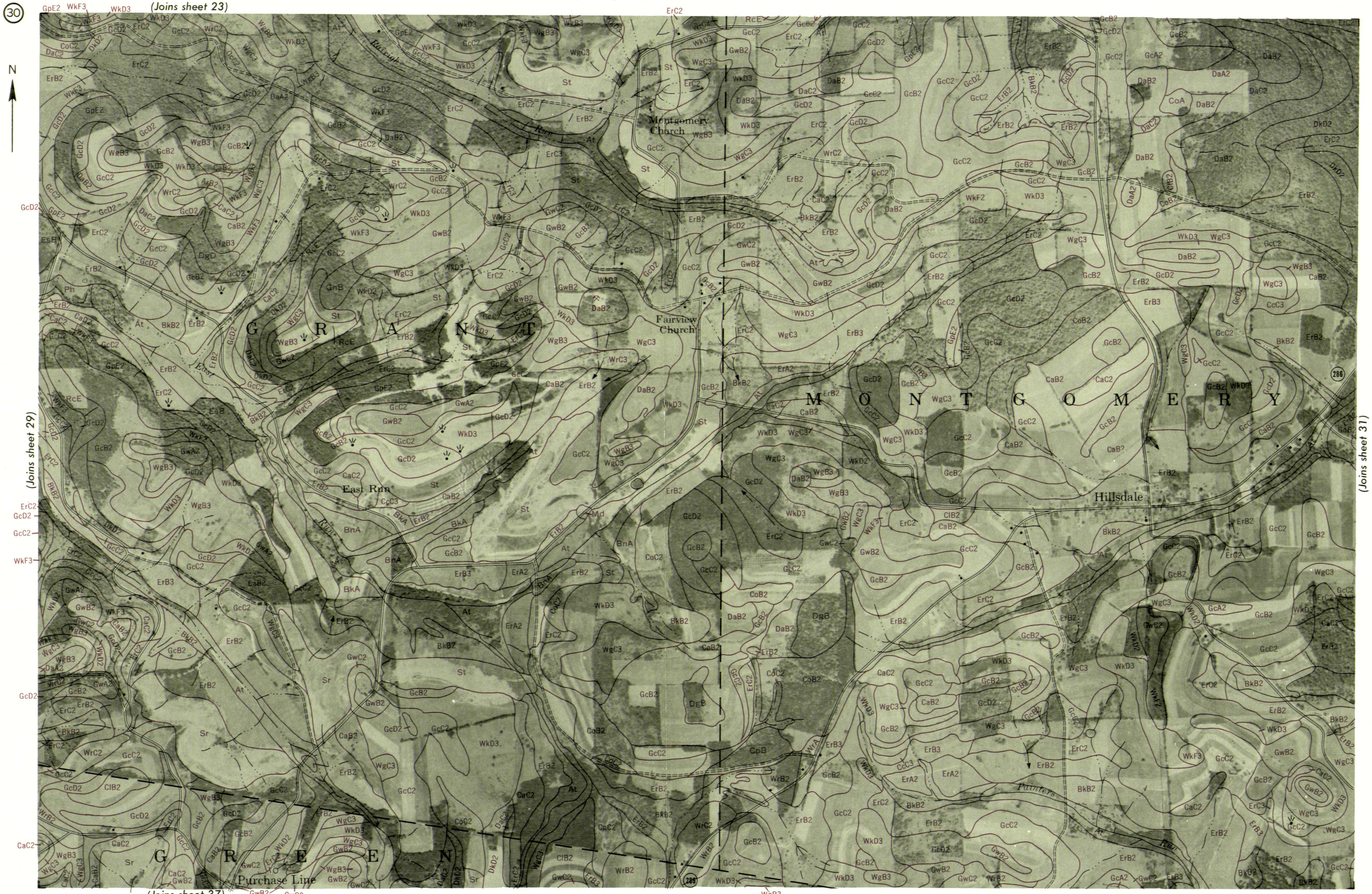
N

This map is one of a set compiled in 1966 as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, and the Pennsylvania State University, College of Agriculture and Agricultural Experiment Station, and the Pennsylvania Department of Agriculture State Soil and Water Conservation Commission.


0 ½ 1 Mile Scale 1:15 840 0 5000 Feet

30

INDIANA COUNTY, PENNSYLVANIA — SHEET NUMBER 30




0 ½ 1 Mile Scale 1:15 840 0 5000 Feet

(Joins sheet 24)


(Joins sheet 30)

(Joins sheet 38)

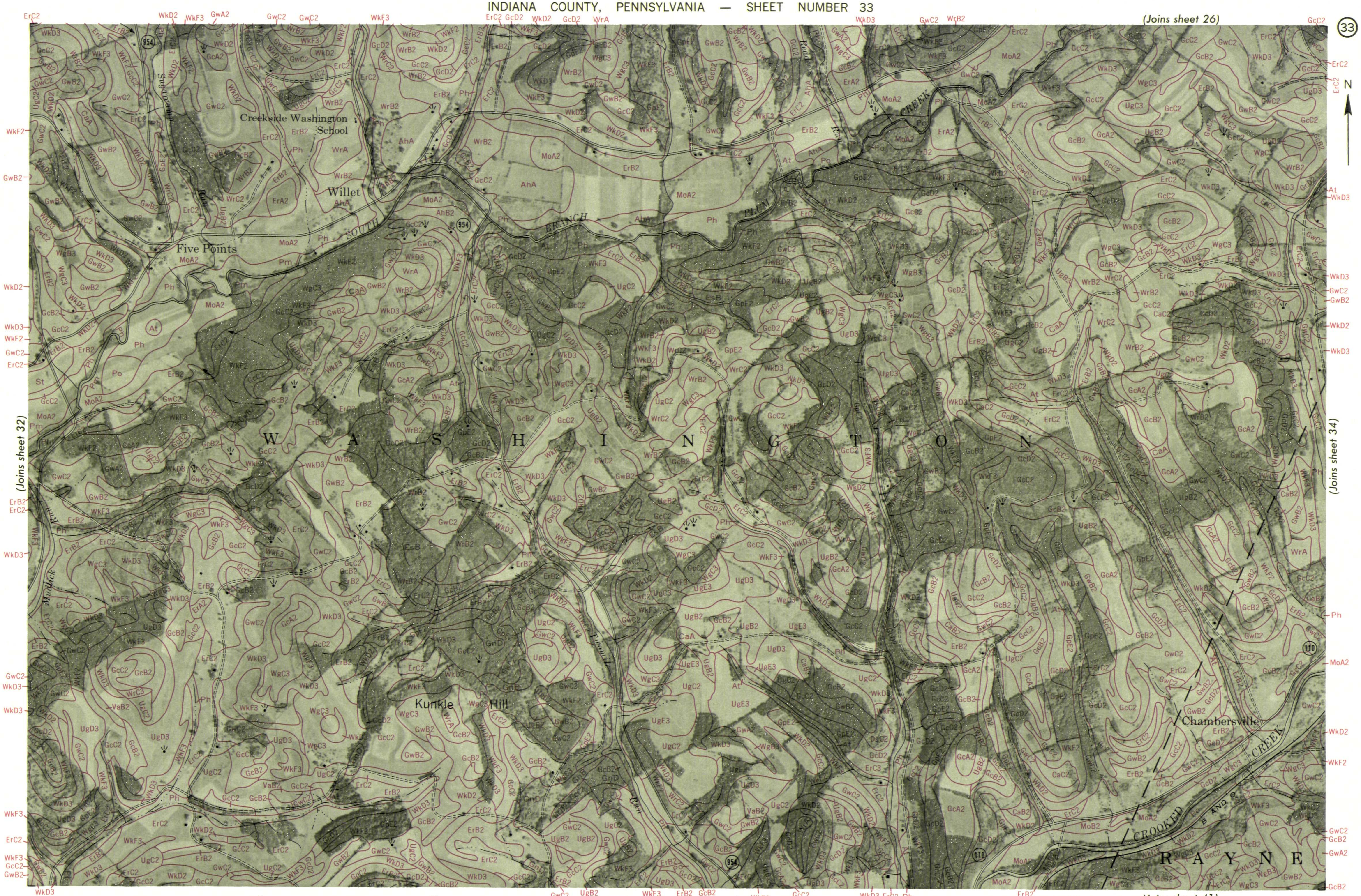
0 ½ 1 Mile
Scale 1:15 840
0 5000 Feet

This map is one of a set compiled in 1966 as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, the Pennsylvania State University, College of Agriculture and Agricultural Experiment Station, and the Pennsylvania Department of Agriculture State Soil and Water Conservation Commission.

INDIANA COUNTY, PENNSYLVANIA — SHEET NUMBER 32

N


0 ½ 1 Mile Scale 1:15 840 0 5000 Feet

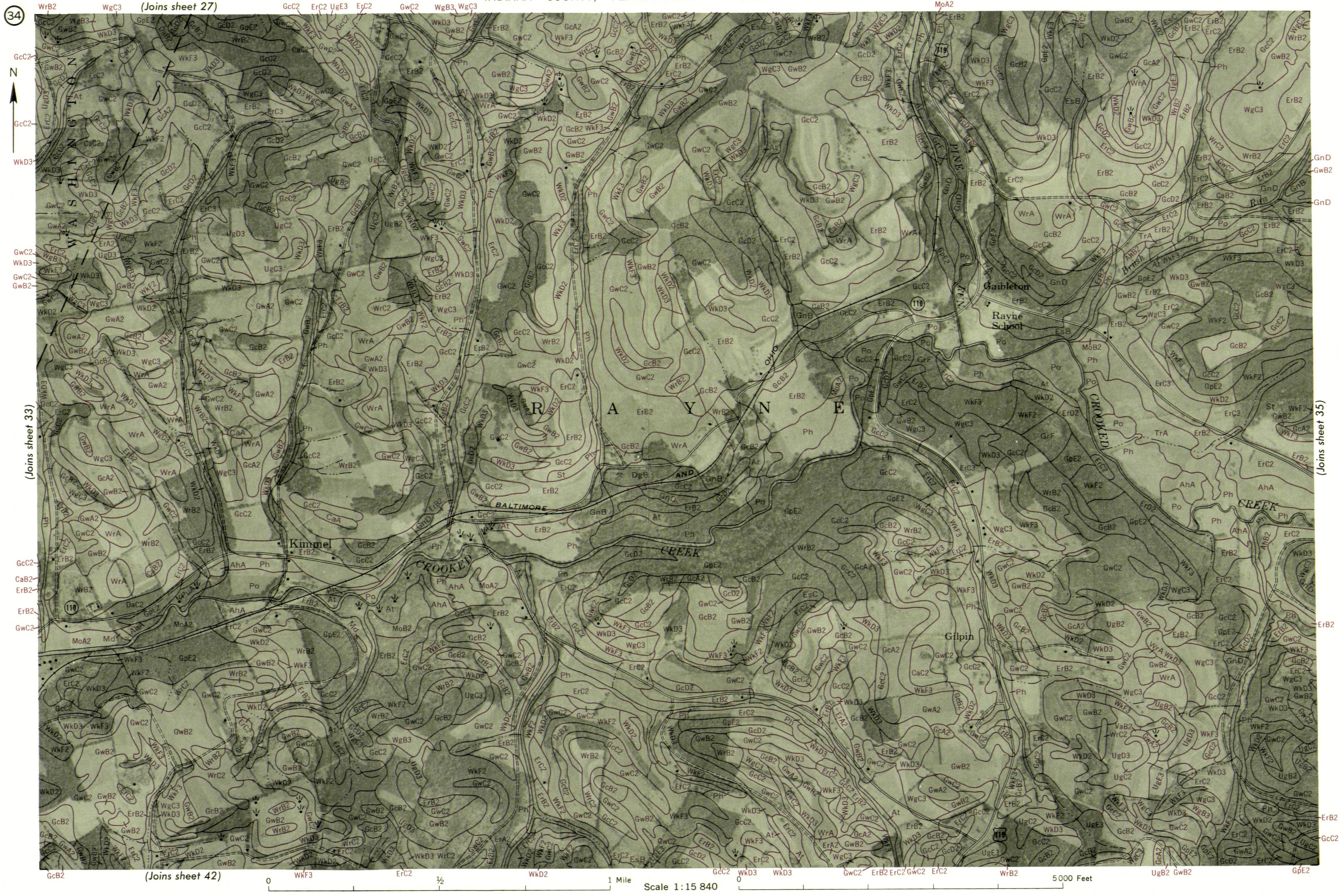



This map is one of a set compiled in 1966 as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, the Pennsylvania State University, College of Agriculture and Agricultural Experiment Station, and the Pennsylvania Department of Agriculture State Soil and Water Conservation Commission.

0 ½ 1 Mile

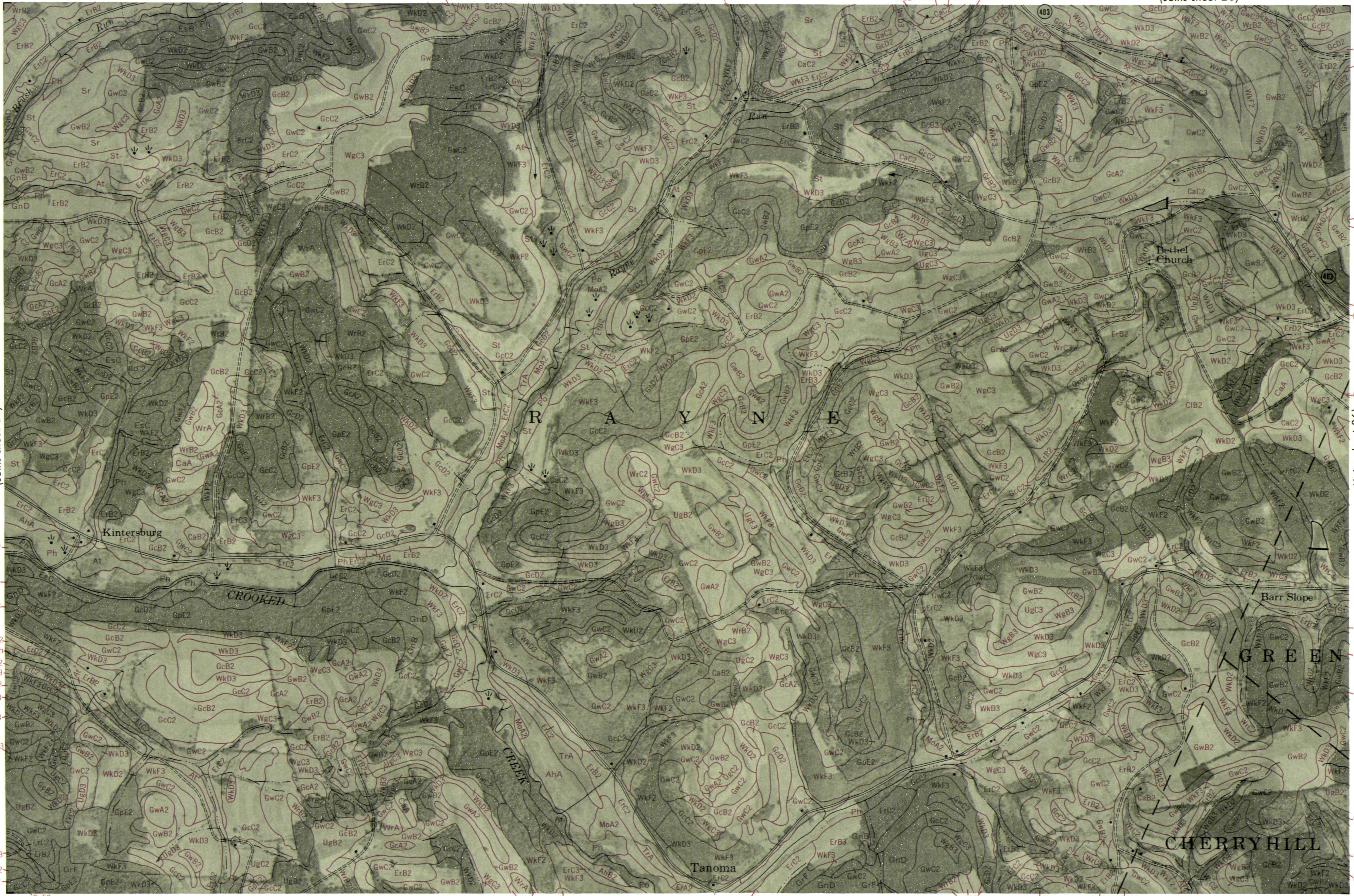
Scale 1:15 840

0 5000 Feet


34
(Joins sheet 27)
(Joins sheet 33)
(Joins sheet 35)
(Joins sheet 42)
N
WASHINGTON
RAYNE
Kimmel
Gaibleton
Rayne School
Gilpin
CROOKED CREEK
BALTIMORE AND OHIO
PINE RUN
Brush Run
119
110
0
½
1 Mile
Scale 1:15 840
0
5000 Feet

(Joins sheet 28)

35




(Joins sheet 34)

(Joins sheet 36)

(Joins sheet 43)

0 ½ 1 Mile Scale 1:15 840 0 5000 Feet

This map is one of a set compiled in 1966 as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, the Pennsylvania State University, College of Agriculture and Agricultural Experiment Station, and the Pennsylvania Department of Agriculture State Soil and Water Conservation Commission.

(Joins sheet 29)

(Joins sheet 35)


(Joins sheet 37)

(Joins sheet 44)

0 ½ 1 Mile

Scale 1:15 840

0 5000 Feet

(37)

(Joins sheet 30)


(Joins sheet 36)

(Joins sheet 38)

(Joins sheet 45)

Scale 1:15 840

0 ½ 1 Mile

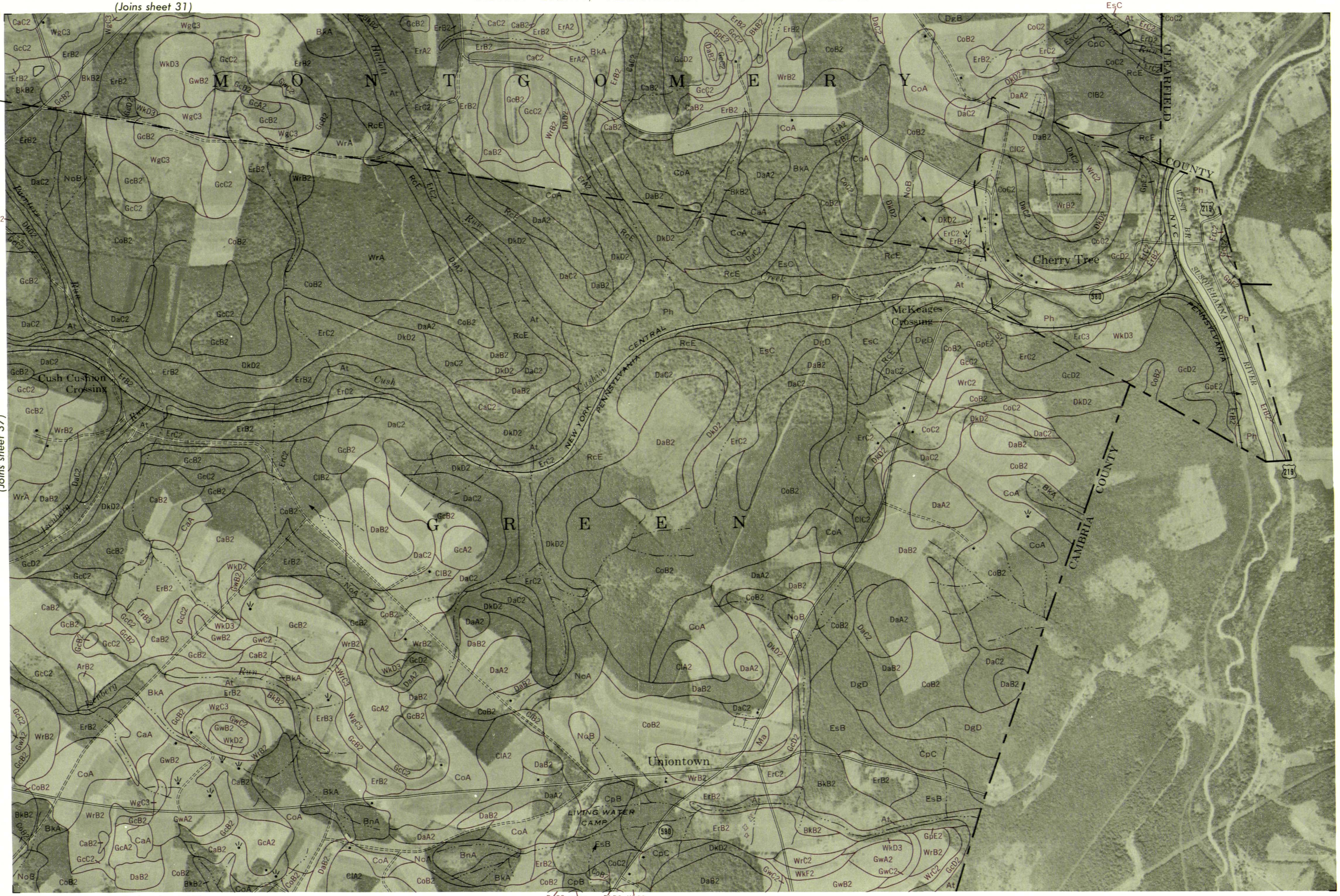
0 5000 Feet

This map is one of a set compiled in 1966 as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, the Pennsylvania State University, College of Agriculture and Agricultural Experiment Station, and the Pennsylvania Department of Agriculture State Soil and Water Conservation Commission.

38

*(Joins sheet 31)*

*(Joins sheet 37)*




*(Joins sheet 46)*

0 ½ 1 Mile Scale 1:15 840 0 5000 Feet

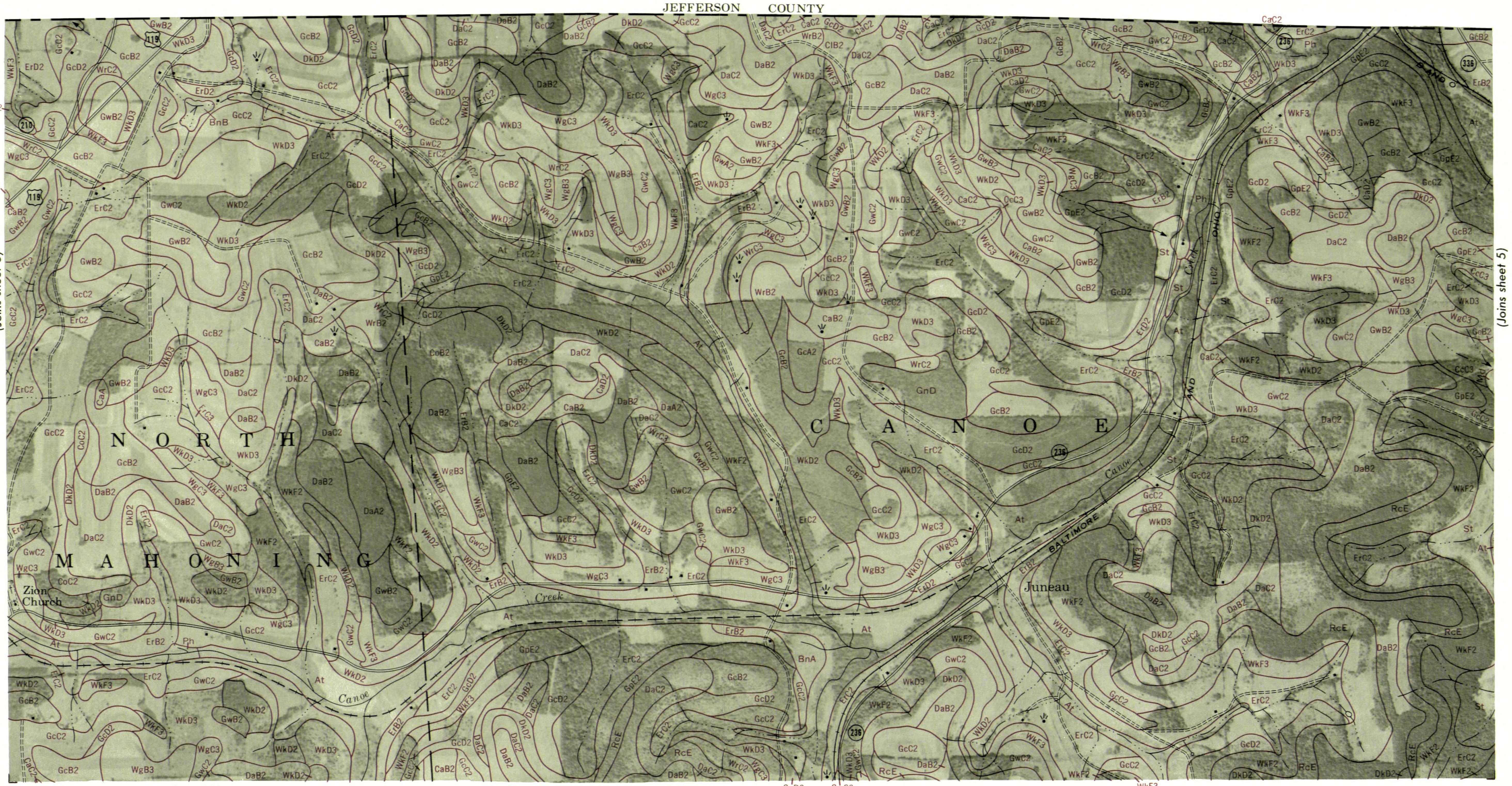
This map is one of a set compiled in 1966 as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, the Pennsylvania State University, College of Agriculture and Agricultural Experiment Station, and the Pennsylvania Department of Agriculture State Soil and Water Conservation Commission.



0 ½ 1 Mile Scale 1:15 840 0 5000 Feet

4

N

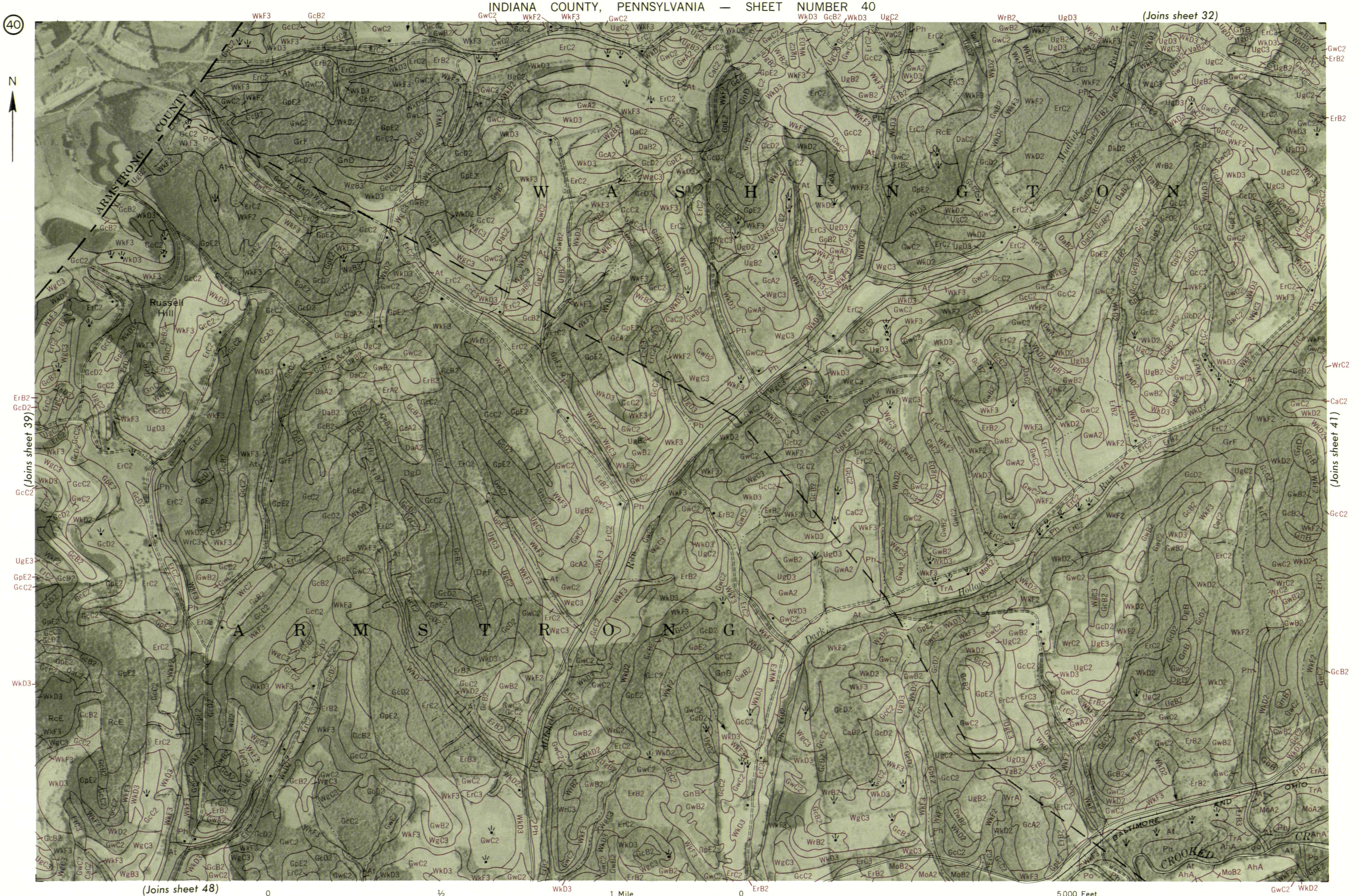



(Joins sheet 10)

0 ½ 1 Mile

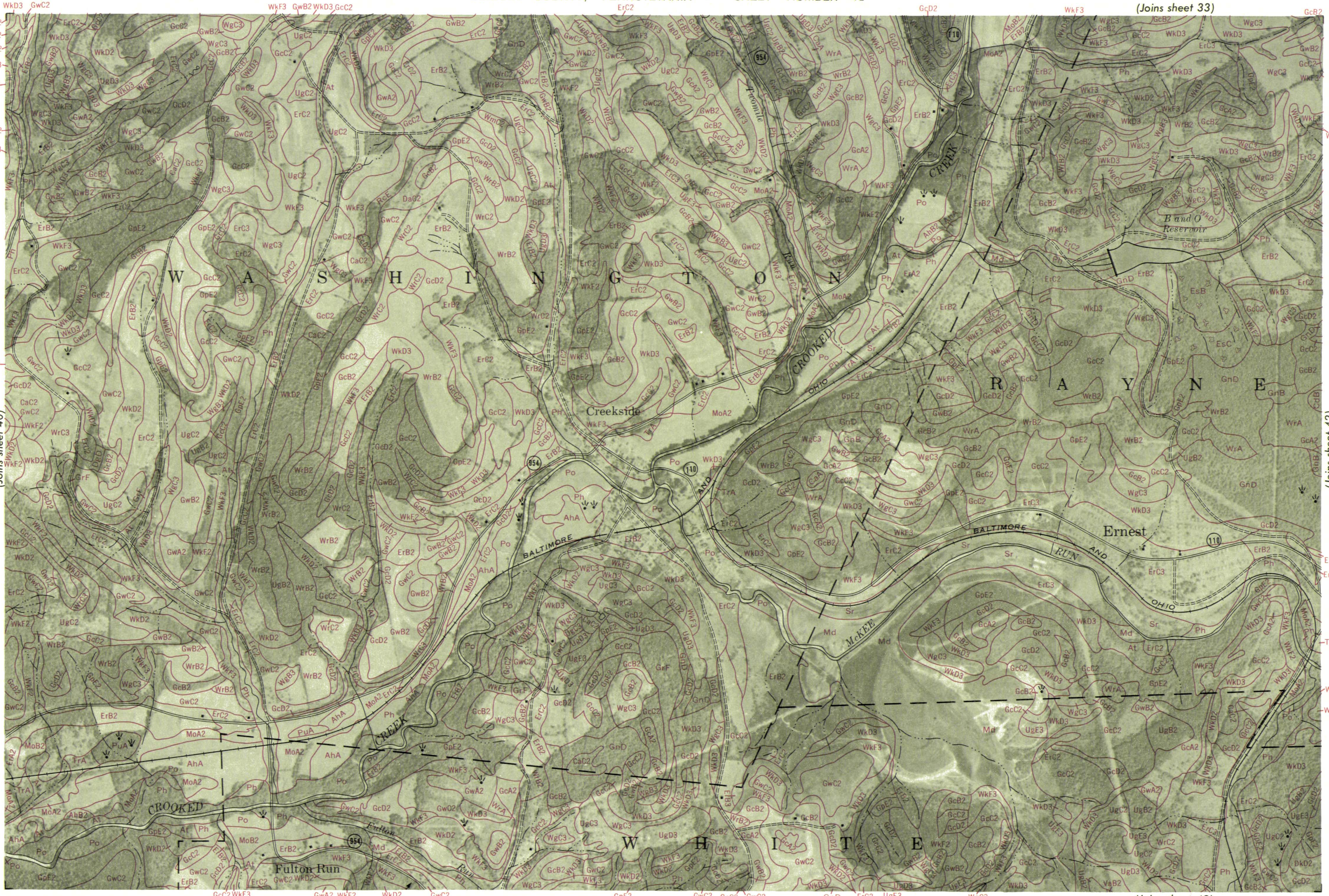
Scale 1:15 840

0 5000 Feet




0 ½ 1 Mile Scale 1:15 840 0 5000 Feet

41




This map is one of a set compiled in 1966 as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, the Pennsylvania State University, College of Agriculture and Agricultural Experiment Station, and the Pennsylvania Department of Agriculture State Soil and Water Conservation Commission.

0 ½ 1 Mile — Scale 1:15 840 — 0 5000 Feet

(Joins sheet 34)

(Joins sheet 41)


(Joins sheet 43)

(Joins sheet 50)

0 ½ 1 Mile Scale 1:15 840 0 5000 Feet


This map is one of a set compiled in 1966 as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, the Pennsylvania State University, College of Agriculture and Agricultural Experiment Station, and the Pennsylvania Department of Agriculture State Soil and Water Conservation Commission.

44

(Joins sheet 36)


(Joins sheet 43)

(Joins sheet 45)

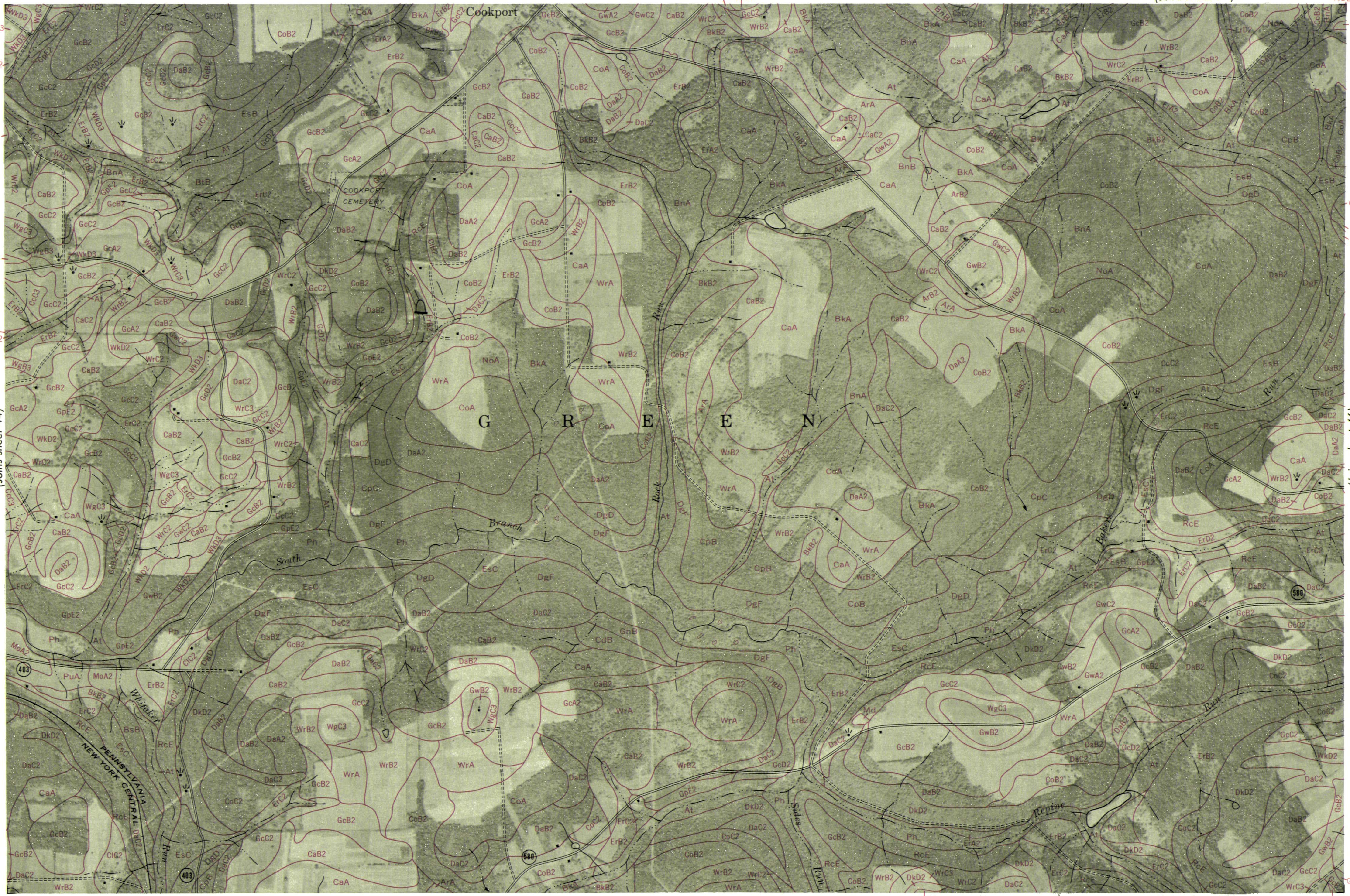
(Joins sheet 52)

0 ½ 1 Mile

Scale 1:15 840

0 5000 Feet

(Joins sheet 37)




(Joins sheet 44)

(Joins sheet 46)

(Joins sheet 53)

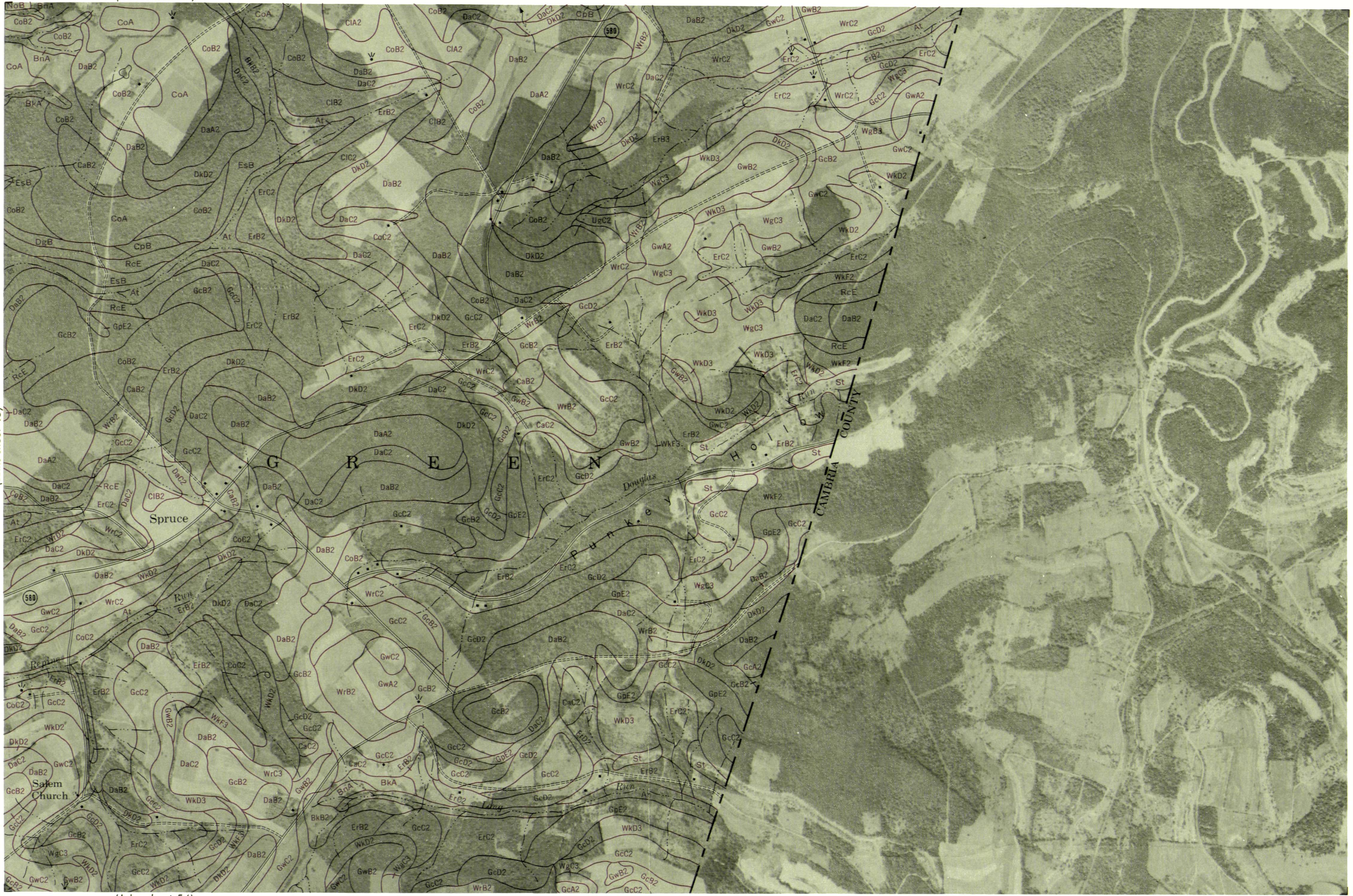
0 ½ 1 Mile Scale 1:15 840 0 5000 Feet

This map is one of a set compiled in 1966 as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, the Pennsylvania State University, College of Agriculture and Agricultural Experiment Station, and the Pennsylvania Department of Agriculture State Soil and Water Conservation Commission.

46

(Joins sheet 38)

(Joins sheet 45)




(Joins sheet 54)

0 ½ 1 Mile

Scale 1:15 840

0 5000 Feet

(Joins sheet 39)

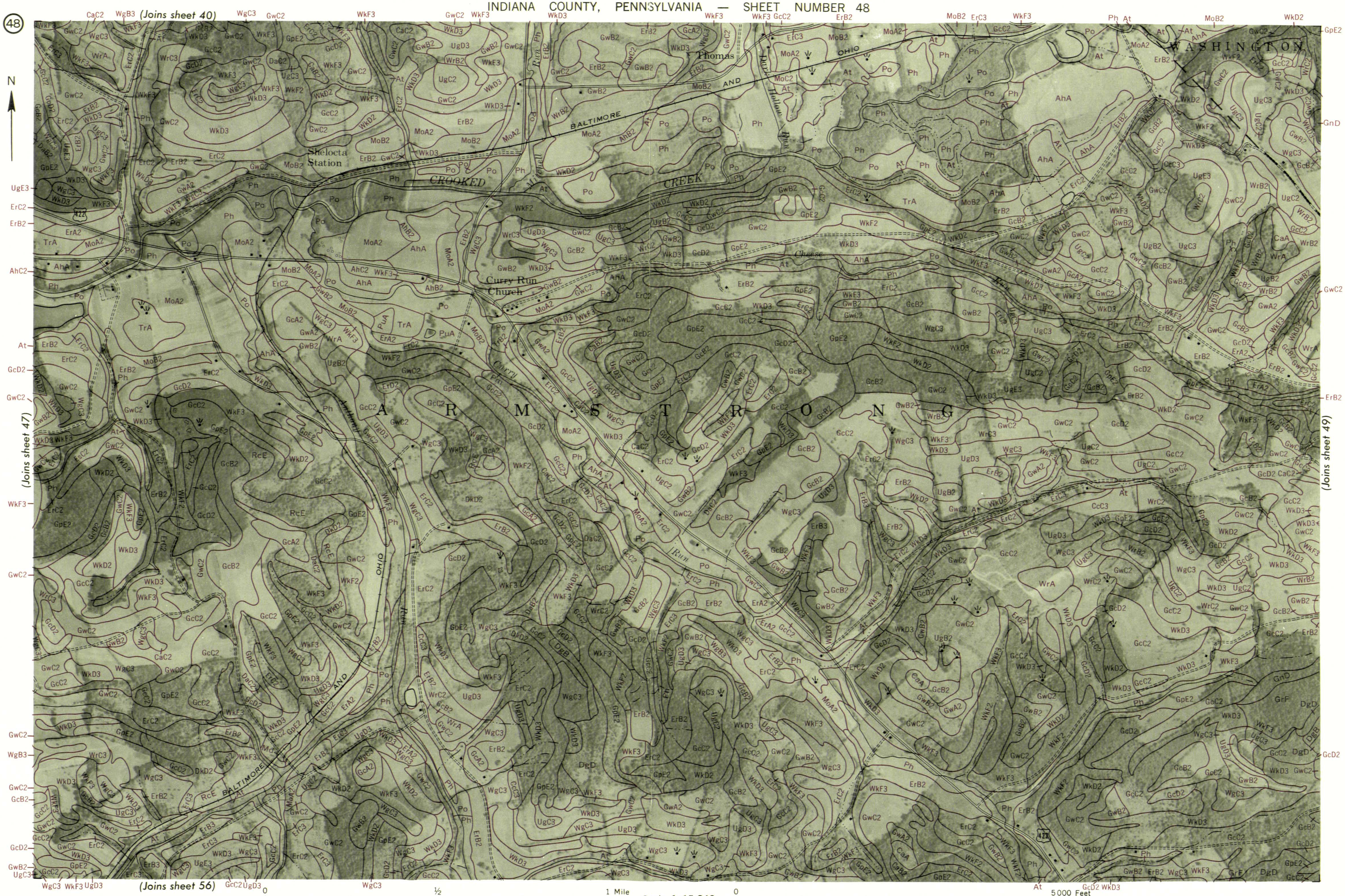
47


(Joins sheet 48)

(Joins sheet 55)

0 ½ 1 Mile Scale 1:15 840 0 5000 Feet

This map is one of a set compiled in 1966 as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, the Pennsylvania State University, College of Agriculture and Agricultural Experiment Station, and the Pennsylvania Department of Agriculture State Soil and Water Conservation Commission.



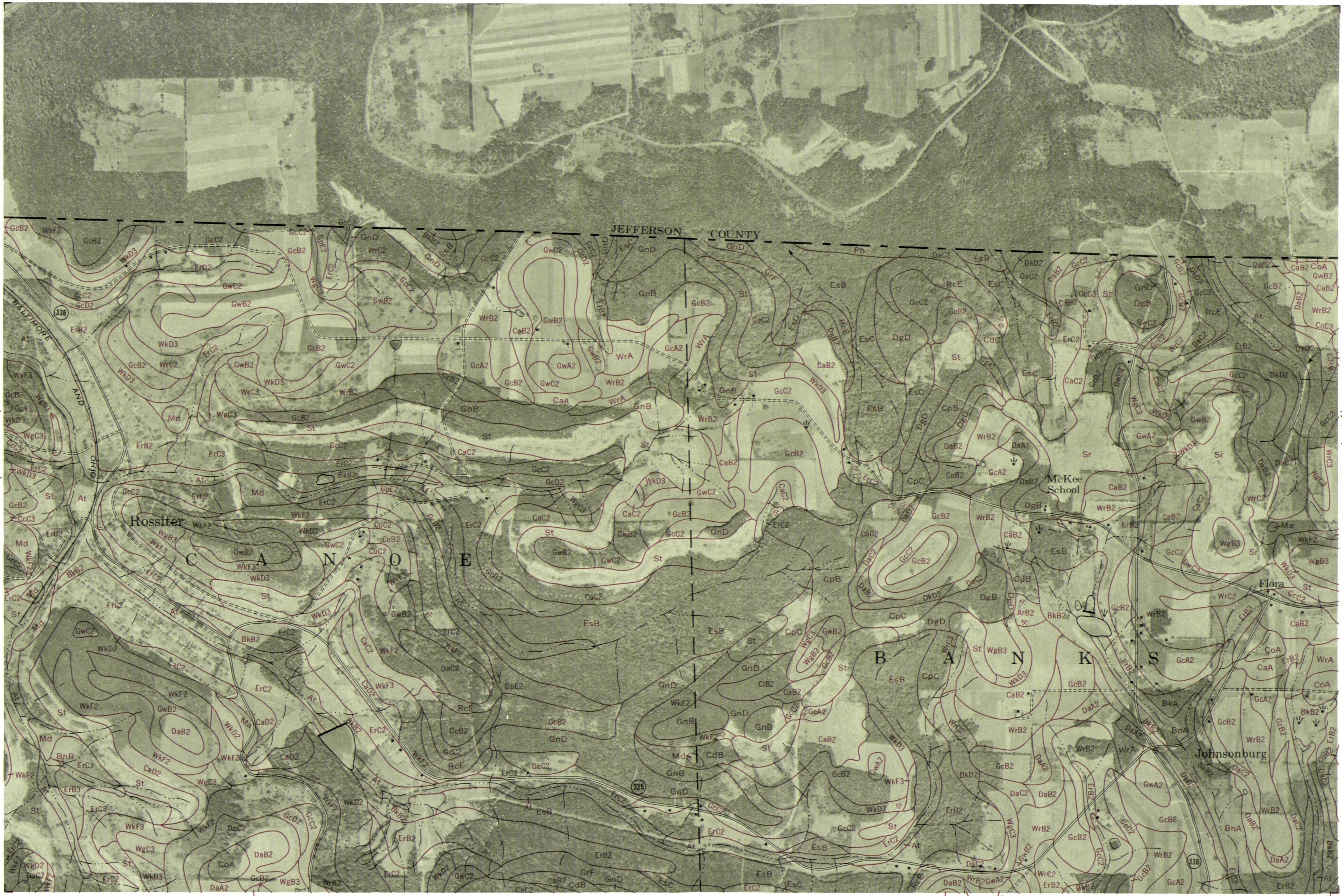

0 ½ 1 Mile
Scale 1:15 840
0 5000 Feet


This map is one of a set compiled in 1966 as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, the Pennsylvania State University, College of Agriculture and Agricultural Experiment Station, and the Pennsylvania Department of Agriculture State Soil and Water Conservation Commission.

5

N

(Joins sheet 4)




(Joins sheet 6)

(Joins sheet 11)

0 ½ 1 Mile Scale 1:15 840 0 5000 Feet

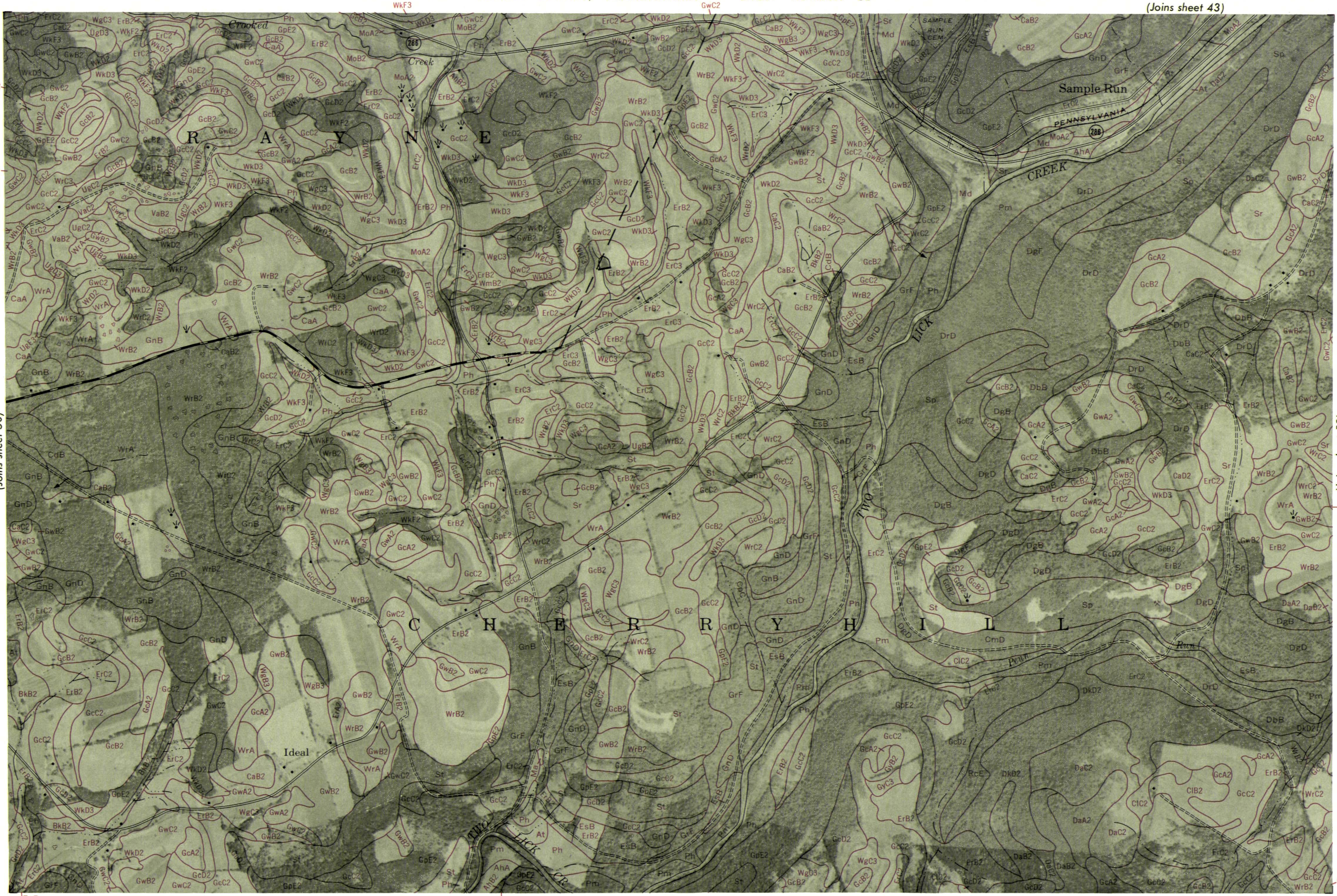
This map is one of a set compiled in 1966 as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, the Pennsylvania State University, College of Agriculture and Agricultural Experiment Station, and the Pennsylvania Department of Agriculture State Soil and Water Conservation Commission.


50
(Joins sheet 42)
(Joins sheet 49)
(Joins sheet 51)
(Joins sheet 58)
N
BALTIMORE AND OHIO
W H I T E
R A Y N E
C H E R R Y H I L L
Bryan Hill Manor
Fowler Heights
COUNTRY CLUB
New Indiana School
INDIANA
JIMMY STEWART AIRPORT
0 ½ 1 Mile
Scale 1:15 840
0 5000 Feet

(Joins sheet 43)

(Joins sheet 50)

(Joins sheet 52)




(Joins sheet 59)

0 ½ 1 Mile

Scale 1:15 840

0 5000 Feet

This map is one of a set compiled in 1966 as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, the Pennsylvania State University, College of Agriculture and Agricultural Experiment Station, and the Pennsylvania Department of Agriculture State Soil and Water Conservation Commission.

(Joins sheet 44)


(Joins sheet 51)

(Joins sheet 53)

(Joins sheet 60)

0 ½ 1 Mile

Scale 1:15 840

0 5000 Feet

(53)

(Joins sheet 45)


(Joins sheet 52)

(Joins sheet 54)

(Joins sheet 61)

0 ½ 1 Mile

Scale 1:15 840

0 5000 Feet

This map is one of a set compiled in 1966 as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, the Pennsylvania State University, College of Agriculture and Agricultural Experiment Station, and the Pennsylvania Department of Agriculture State Soil and Water Conservation Commission.

54

(Joins sheet 46)

(Joins sheet 53)


(Joins inset)

(Joins lower left)

(Joins sheet 61)


(Joins sheet 69)

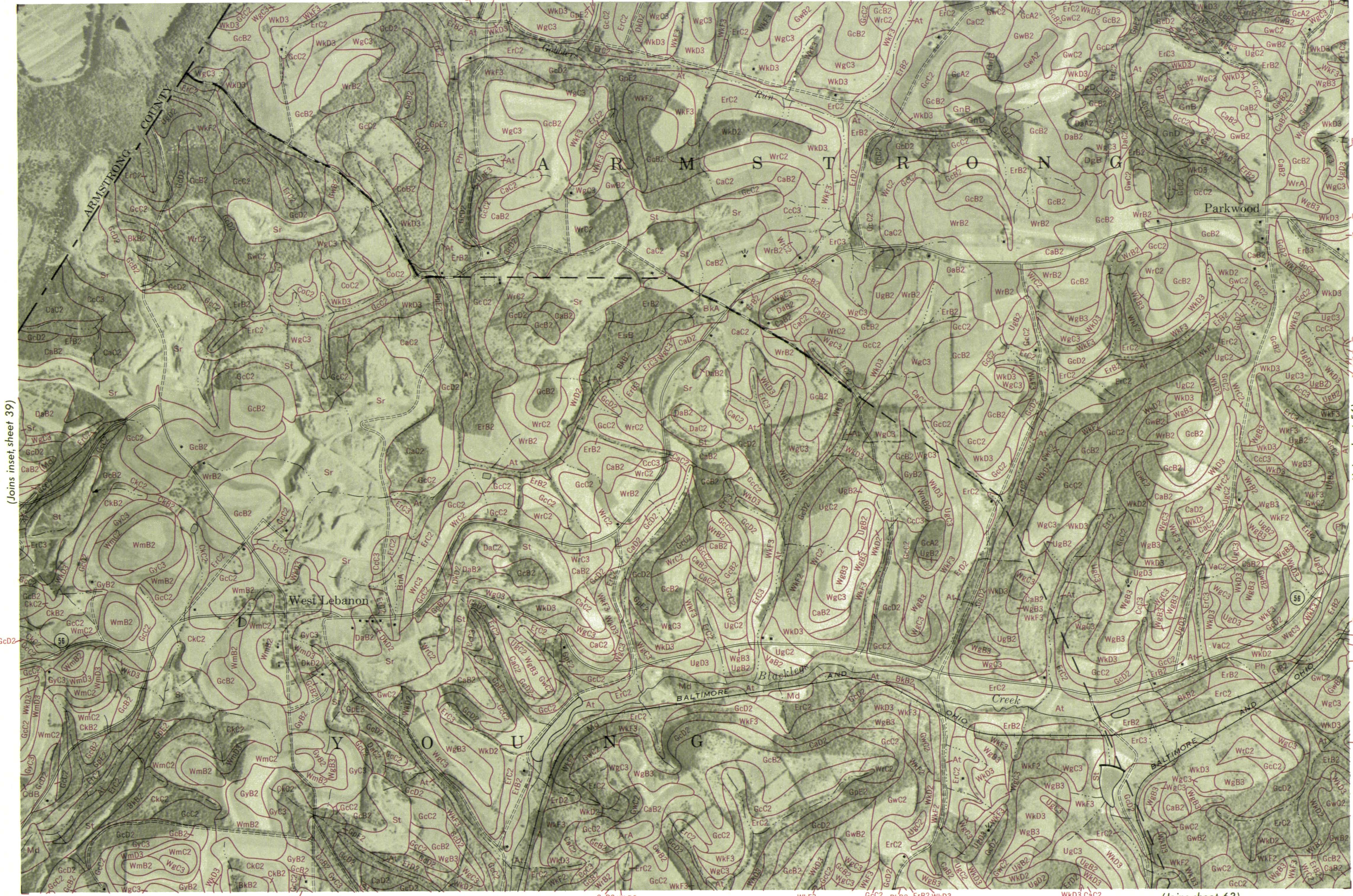
0 ½ 1 Mile

Scale 1:15 840

0 5000 Feet

55

(Joins sheet 47)




(Joins inset, sheet 39)

(Joins sheet 56)

(Joins sheet 63)

This map is one of a set compiled in 1966 as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, the Pennsylvania State University, College of Agriculture and Agricultural Experiment Station, and the Pennsylvania Department of Agriculture State Soil and Water Conservation Commission.

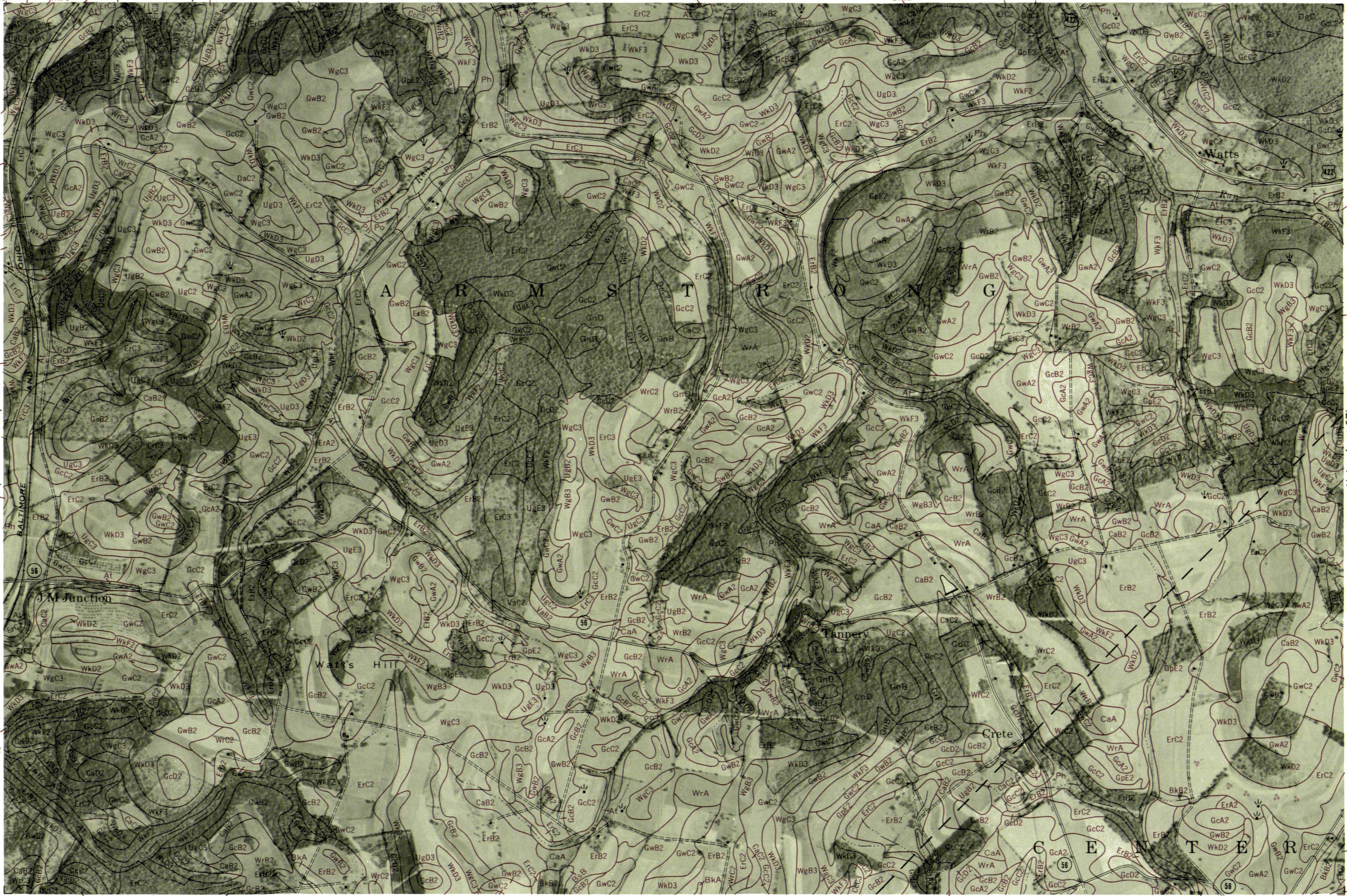
0 ½ 1 Mile

Scale 1:15 840

0 5 000 Feet

(Joins sheet 48)

(Joins sheet 55)




(Joins sheet 57)

(Joins sheet 64)

0 ½ 1 Mile Scale 1:15 840 0 5000 Feet

(Joins sheet 49)

57


(Joins sheet 56)

(Joins sheet 58)

(Joins sheet 65)

0 ½ 1 Mile

Scale 1:15 840

0 5 000 Feet

This map is one of a set compiled in 1966 as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, the Pennsylvania State University, College of Agriculture and Agricultural Experiment Station, and the Pennsylvania Department of Agriculture State Soil and Water Conservation Commission.

(Joins sheet 50)

(Joins sheet 57)


(Joins sheet 59)

(Joins sheet 66)

0 ½ 1 Mile

Scale 1:15 840

0 5000 Feet

59

(Joins sheet 51)

(Joins sheet 58)


(Joins sheet 60)

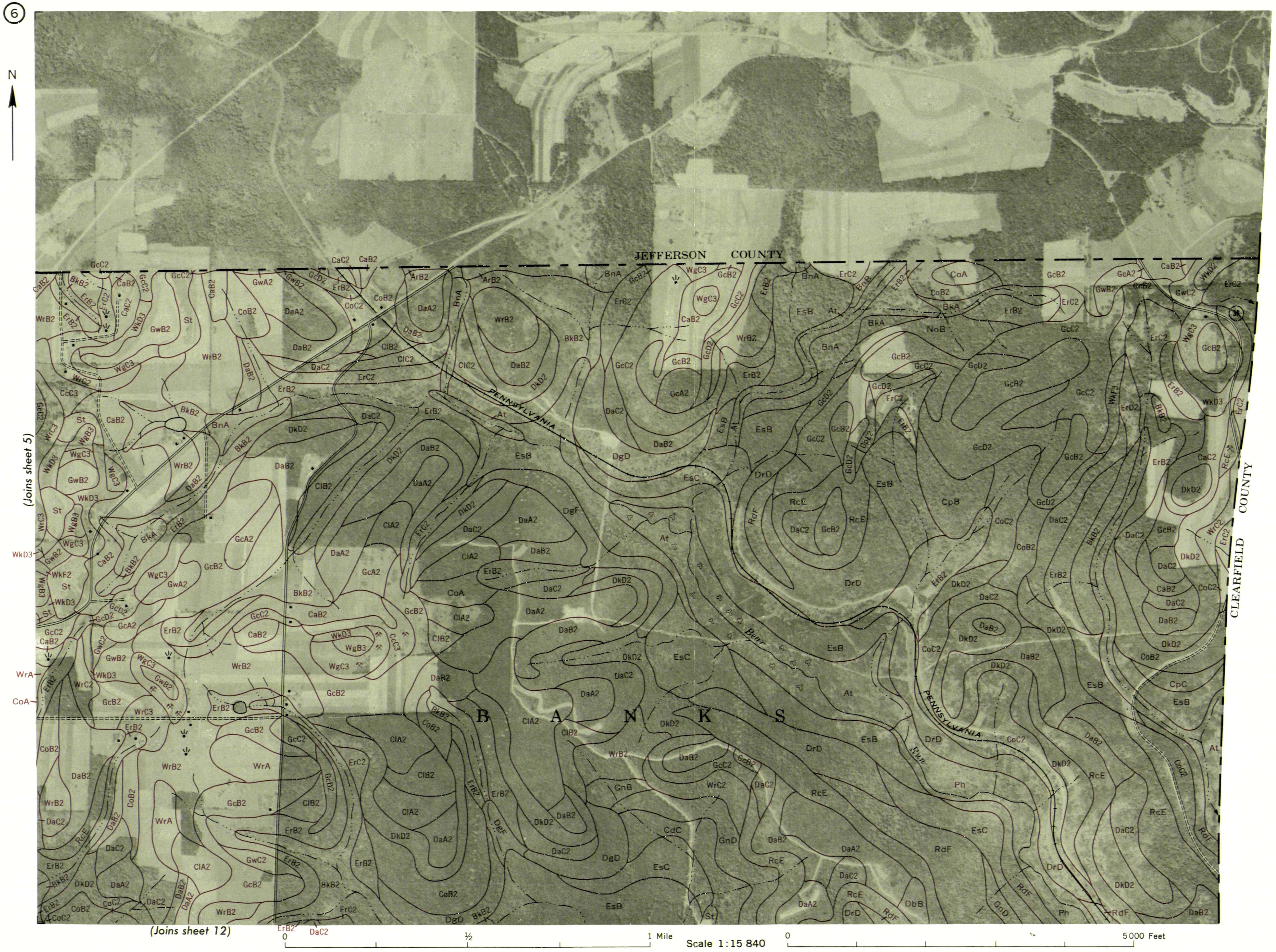
(Joins sheet 67)

0 ½ 1 Mile

Scale 1:15 840

0 5000 Feet

This map is one of a set compiled in 1966 as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, the Pennsylvania State University, College of Agriculture and Agricultural Experiment Station, and the Pennsylvania Department of Agriculture State Soil and Water Conservation Commission.


6
N
JEFFERSON COUNTY
CLEARFIELD COUNTY
PENNSYLVANIA
B A N K S
Bear
Run
(Joins sheet 5)
(Joins sheet 12)
0
½
1 Mile
Scale 1:15 840
0
5000 Feet

(Joins sheet 52)


(Joins sheet 59)

(Joins sheet 61)

(Joins sheet 68)

0 ½ 1 Mile

Scale 1:15 840

0 5000 Feet

(Joins sheet 53)

(Joins sheet 60)

(Joins inset, sheet 54)


(Joins sheet 69)

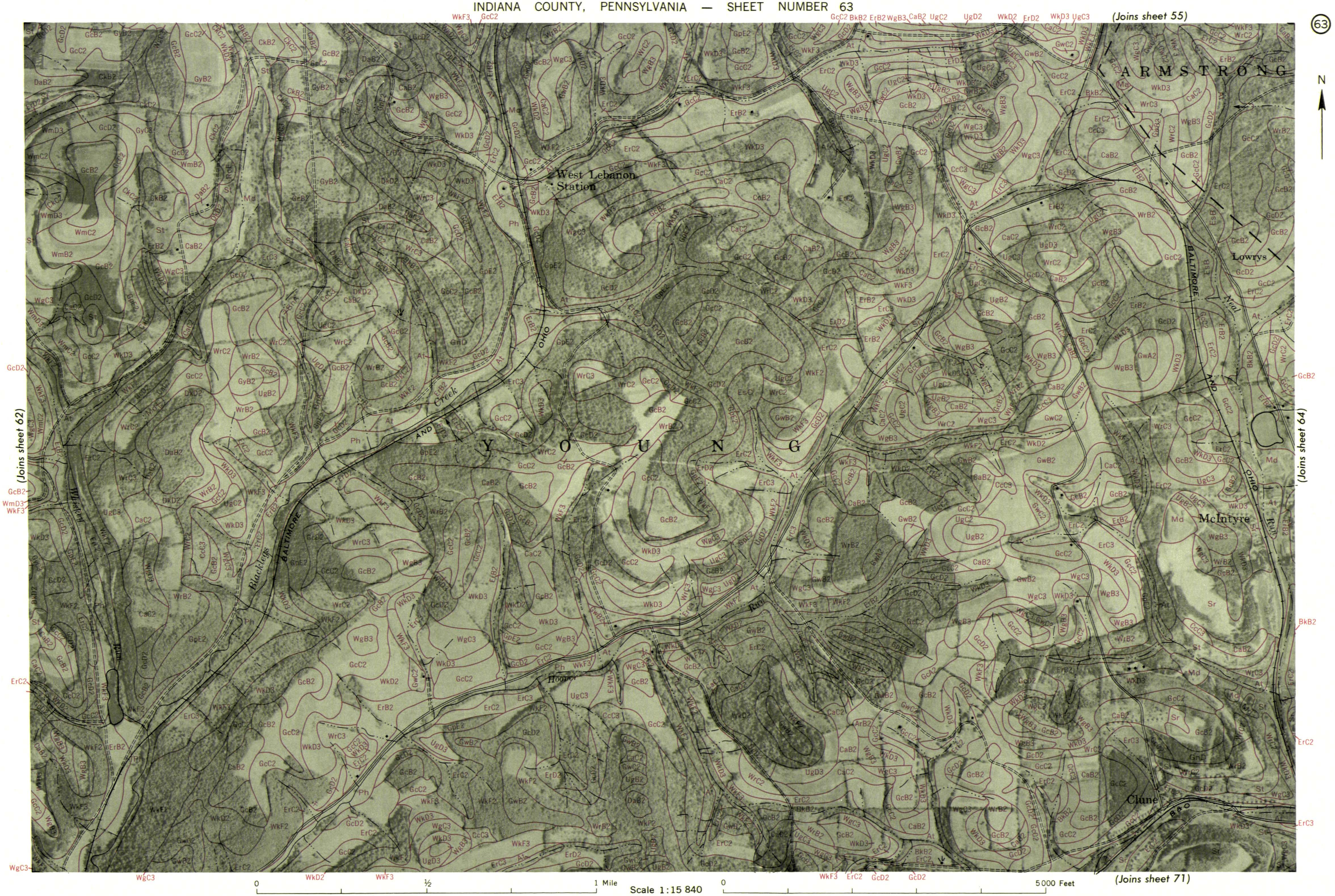
0 ½ 1 Mile

Scale 1:15 840

0 5000 Feet

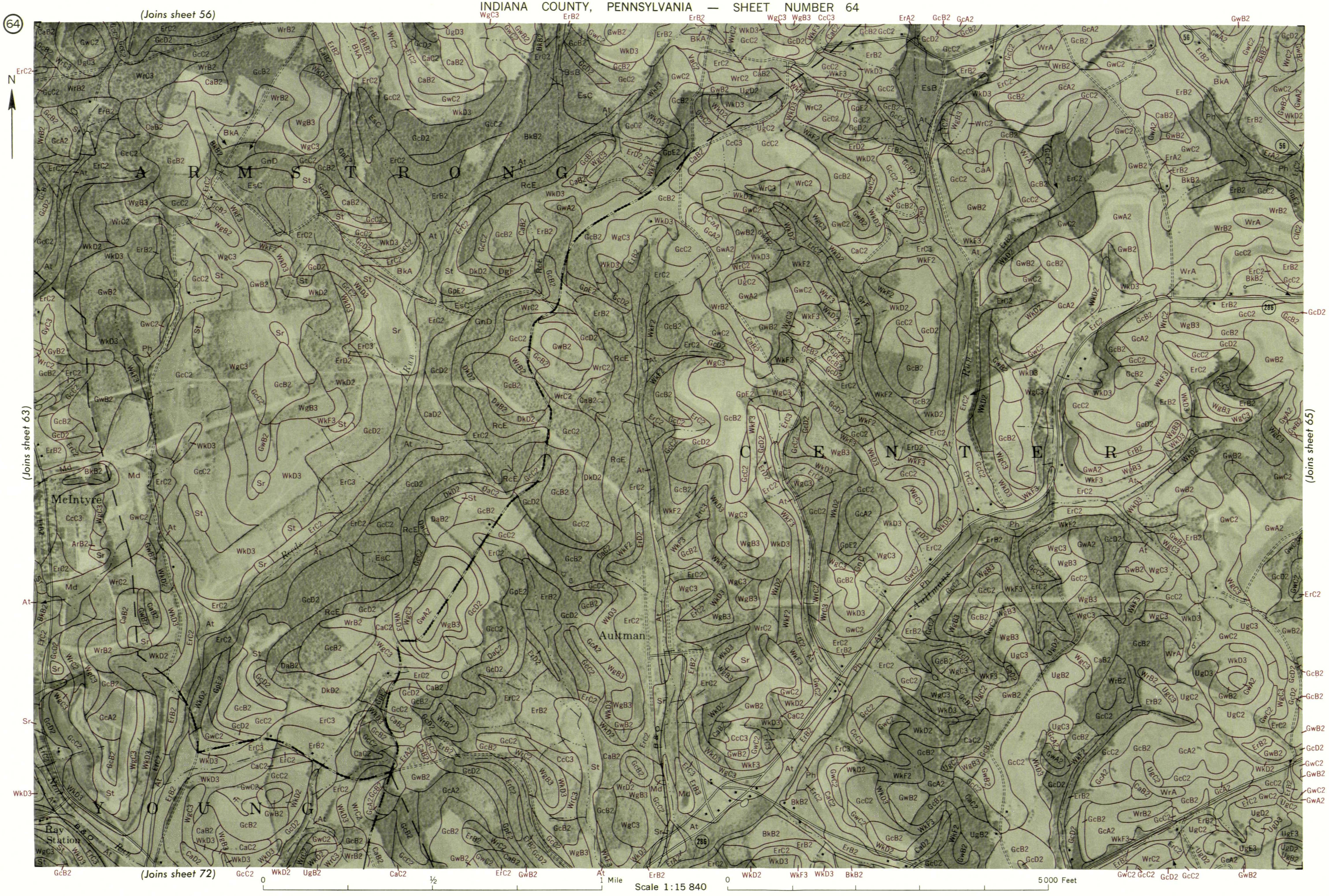
This map is one of a set compiled in 1966 as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, the Pennsylvania State University, College of Agriculture and Agricultural Experiment Station, and the Pennsylvania Department of Agriculture State Soil and Water Conservation Commission.


N
(Joins sheet 39)
(Joins sheet 63)
(Joins sheet 70)
Harttown
Elders Ridge
Elders Ridge Jointure
Iselin
ARMSTRONG COUNTY
Y O U N G
0 ½ 1 Mile
Scale 1:15 840
0 5000 Feet




This map is one of a set compiled in 1966 as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, the Pennsylvania State University, College of Agriculture and Agricultural Experiment Station, and the Pennsylvania Department of Agriculture State Soil and Water Conservation Commission.

INDIANA COUNTY, PENNSYLVANIA — SHEET NUMBER 64



65

(Joins sheet 57)

(Joins sheet 64)


(Joins sheet 66)

(Joins sheet 73)

0 ½ 1 Mile

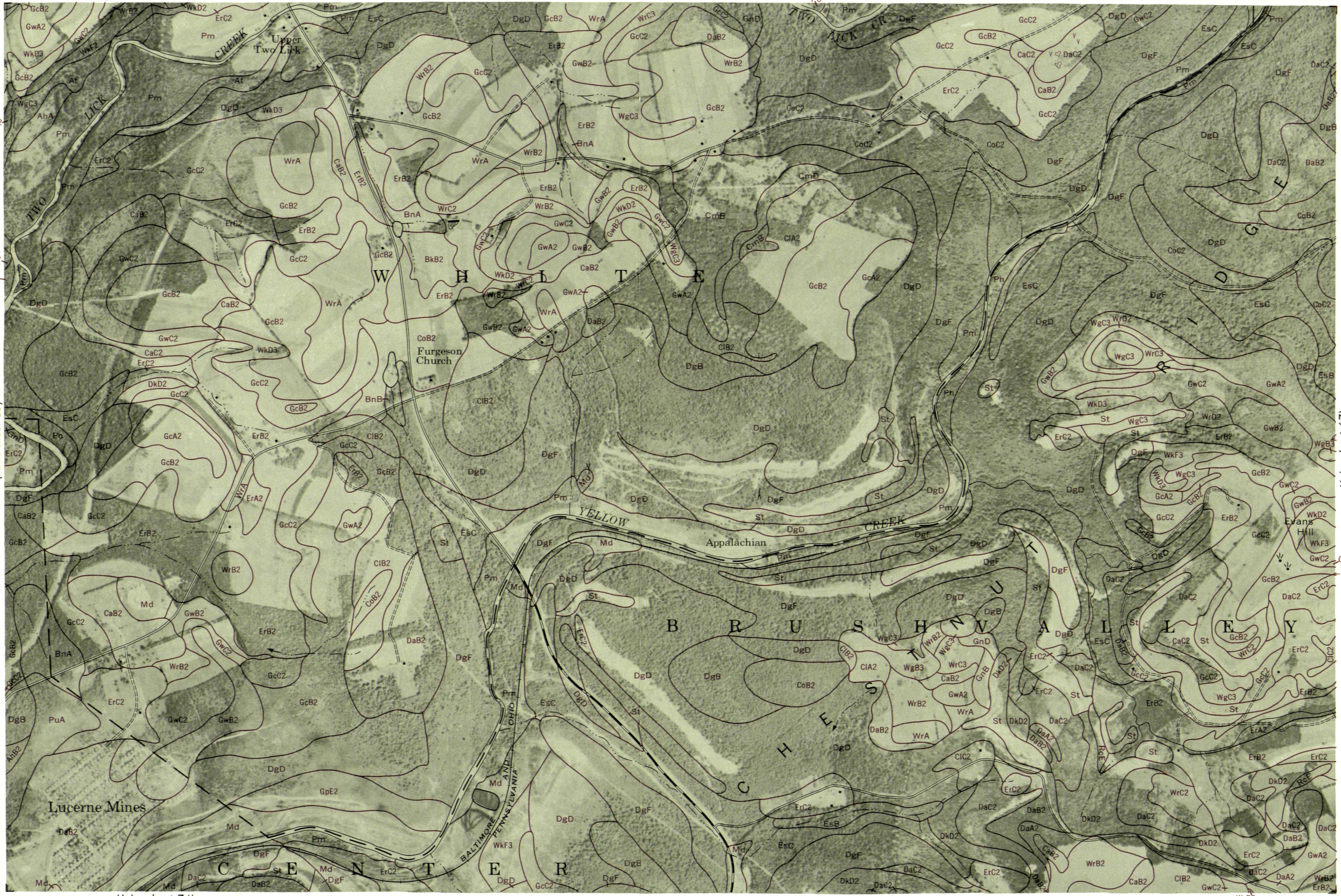
Scale 1:15 840

0 5000 Feet

This map is one of a set compiled in 1966 as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, the Pennsylvania State University, College of Agriculture and Agricultural Experiment Station, and the Pennsylvania Department of Agriculture, State Soil and Water Conservation Commission.

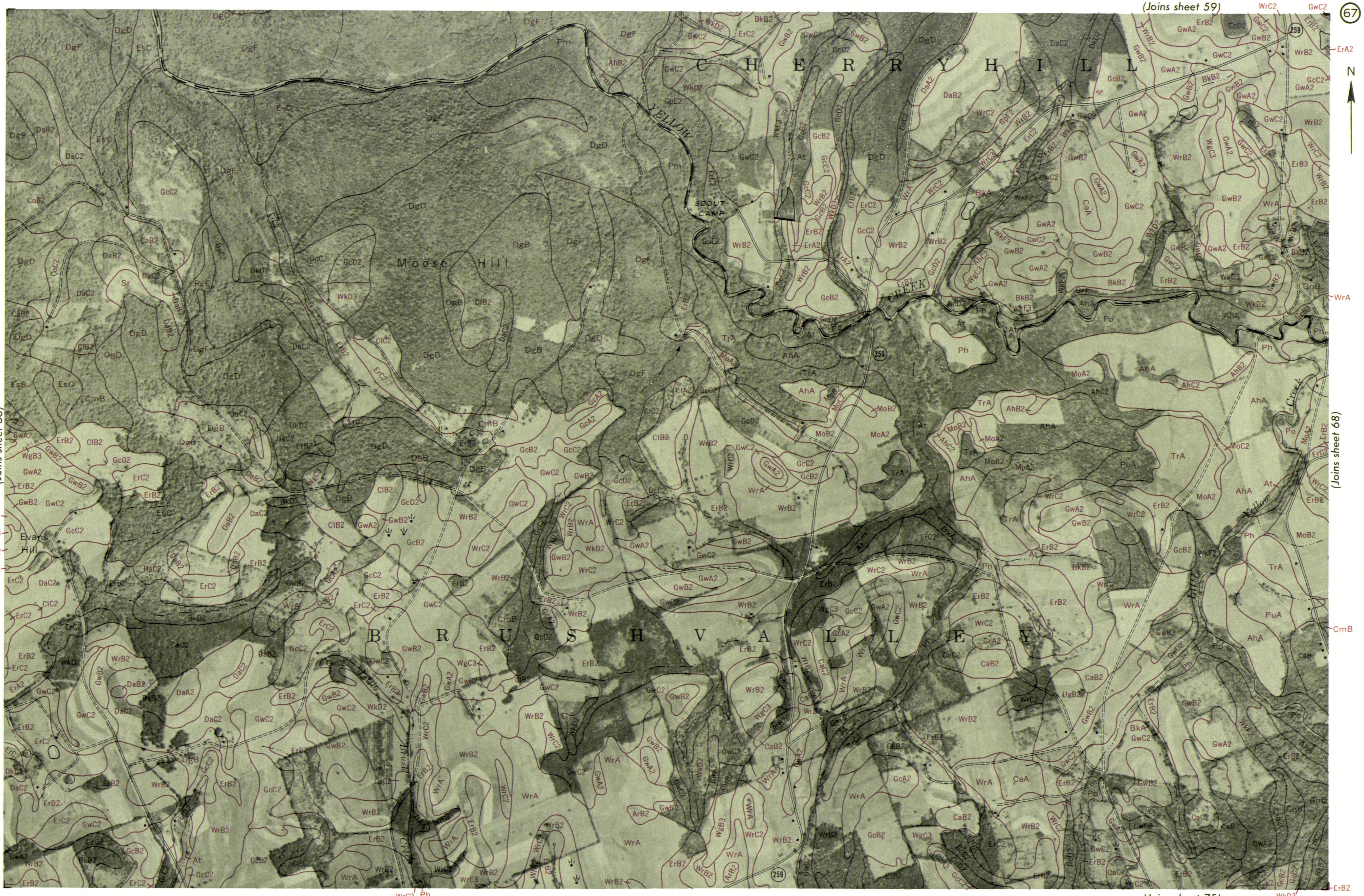
INDIANA COUNTY, PENNSYLVANIA — SHEET NUMBER 66

(Joins sheet 58)




(Joins sheet 74)

0 ½ 1 Mile Scale 1:15 840 0 5000 Feet




0 ½ 1 Mile Scale 1:15 840 0 5000 Feet

This map is one of a set compiled in 1966 as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, the Pennsylvania State University, College of Agriculture and Agricultural Experiment Station, and the Pennsylvania Department of Agriculture State Soil and Water Conservation Commission.

68

(Joins sheet 60)


(Joins sheet 76)

0 ½ 1 Mile Scale 1:15 840 0 5000 Feet


This map is one of a set compiled in 1966 as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, the Pennsylvania State University, College of Agriculture and Agricultural Experiment Station, and the Pennsylvania Department of Agriculture State Soil and Water Conservation Commission.

7

(Joins sheet 1)


(Joins sheet 8)

(Joins sheet 13)

0 ½ 1 Mile

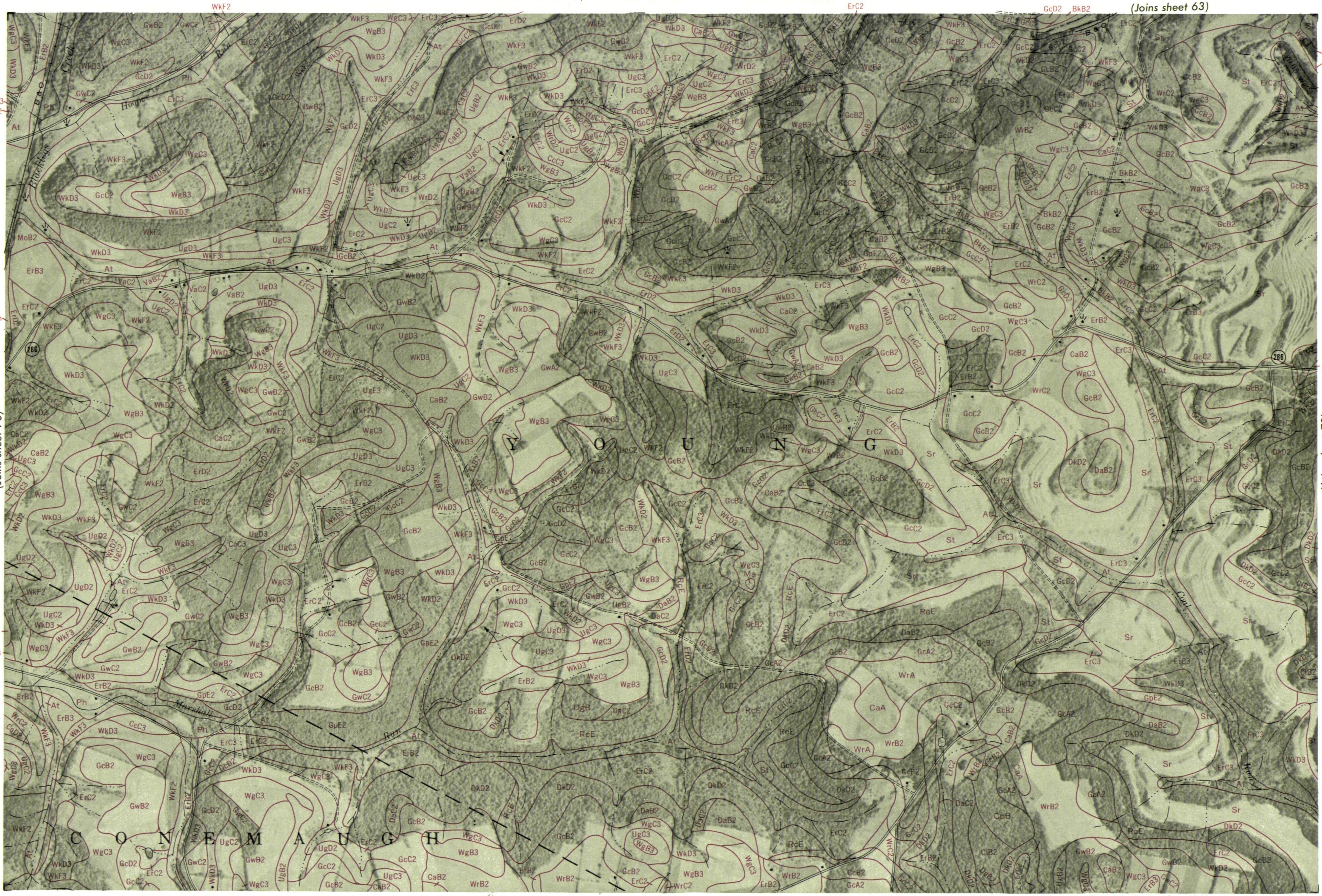
Scale 1:15 840

0 5000 Feet

This map is one of a set compiled in 1966 as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, the Pennsylvania State University, College of Agriculture and Agricultural Experiment Station, and the Pennsylvania Department of Agriculture State Soil and Water Conservation Commission.


0 ½ 1 Mile Scale 1:15 840 0 5000 Feet

(71)



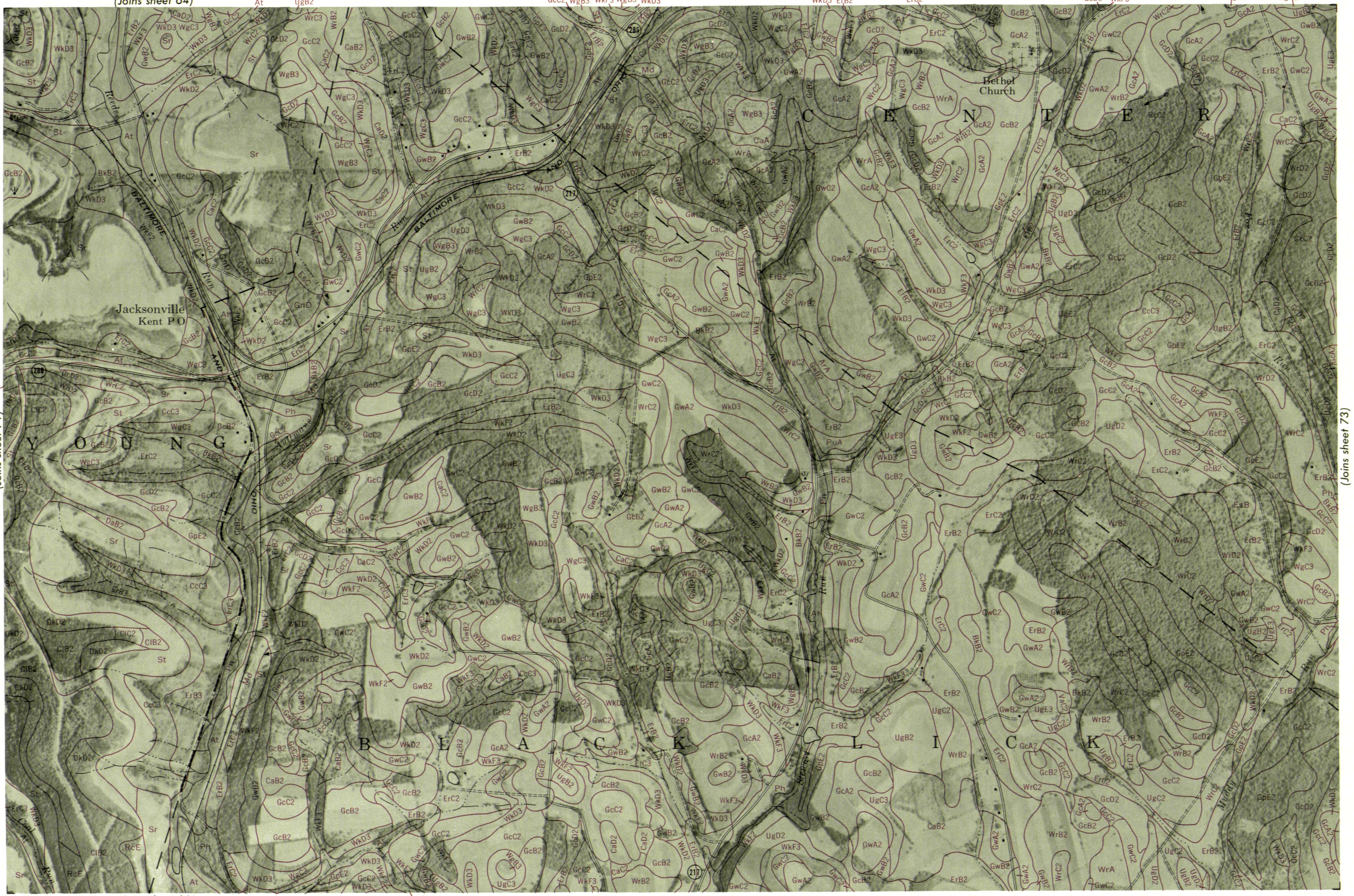

0 ½ 1 Mile Scale 1:15 840 0 5000 Feet

This map is one of a set compiled in 1966 as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, the Pennsylvania State University, College of Agriculture and Agricultural Experiment Station, and the Pennsylvania Department of Agriculture State Soil and Water Conservation Commission.

72

(Joins sheet 64)

(Joins sheet 71)




(Joins sheet 73)

(Joins sheet 81)

0 ½ 1 Mile Scale 1:15 840 0 5000 Feet

(Joins sheet 65)

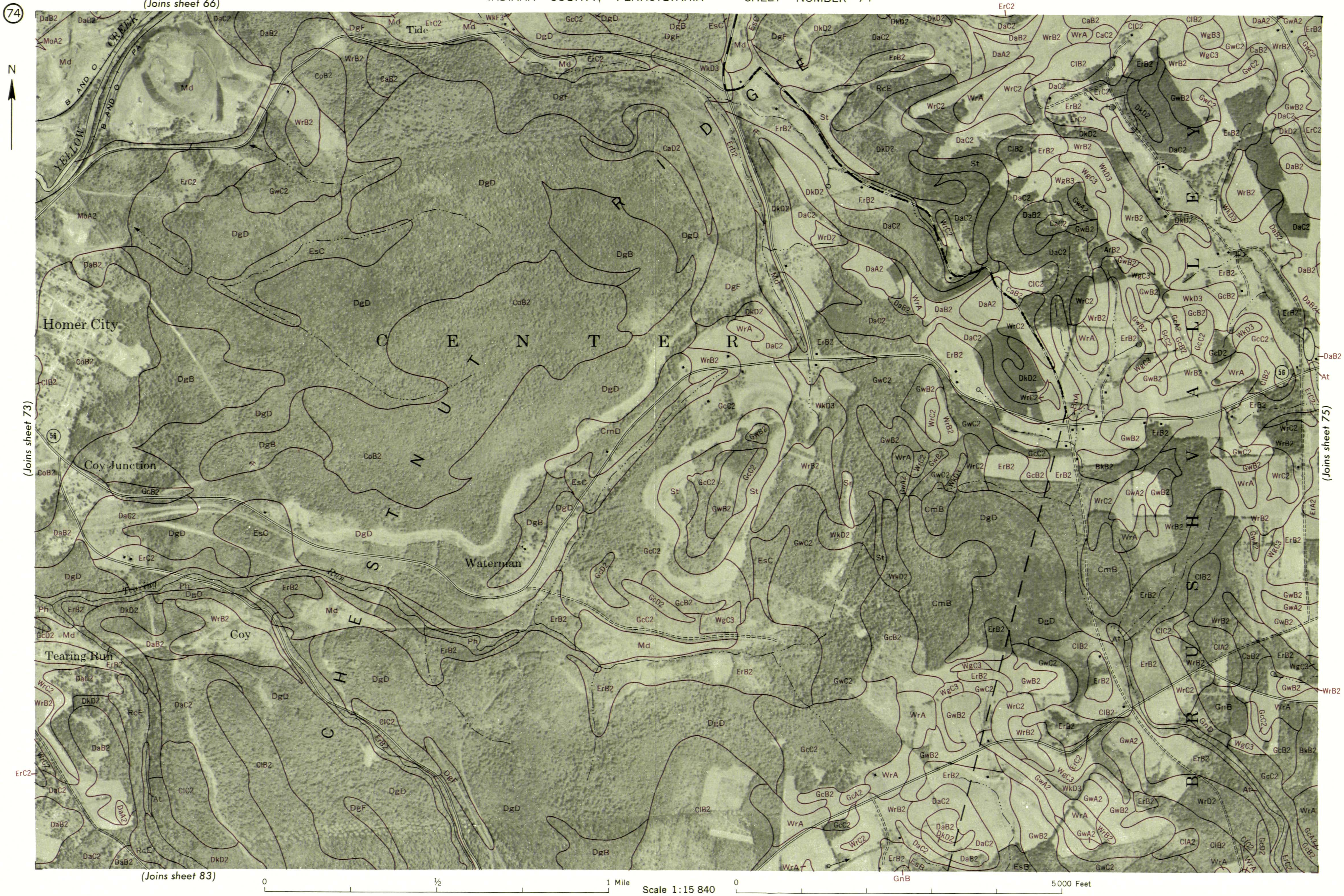
(Joins sheet 72)


(Joins sheet 74)

(Joins sheet 82)

0 ½ 1 Mile Scale 1:15 840 0 5000 Feet

This map is one of a set compiled in 1966 as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, the Pennsylvania State University, College of Agriculture and Agricultural Experiment Station, and the Pennsylvania Department of Agriculture State Soil and Water Conservation Commission.


74
(Joins sheet 66)
(Joins sheet 73)
(Joins sheet 75)
(Joins sheet 83)
N
Homer City
Coy Junction
Waterman
Coy
Tearing Run
Tide
YELLOW CREEK
B AND O
CHESTNUT RIDGE
CENTER
BRUSH VALLEY
56
Scale 1:15 840
0
½
1 Mile
5000 Feet

75

(Joins sheet 67)


(Joins sheet 74)

(Joins sheet 76)

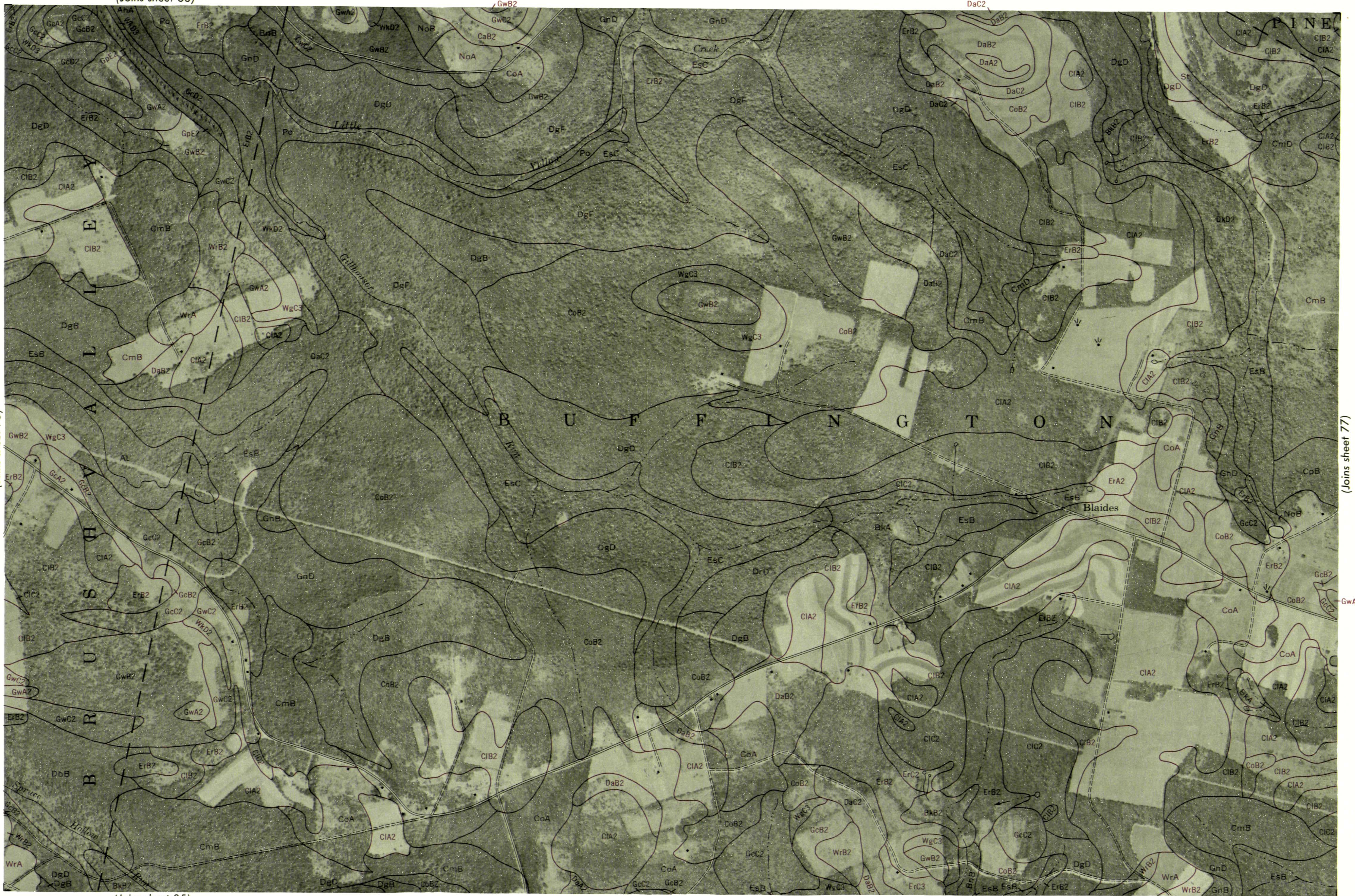
(Joins sheet 84)

0 ½ 1 Mile Scale 1:15 840 0 5000 Feet

This map is one of a set compiled in 1966 as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, the Pennsylvania State University, College of Agriculture and Agricultural Experiment Station, and the Pennsylvania Department of Agriculture State Soil and Water Conservation Commission.

(Joins sheet 68)

(Joins sheet 75)




(Joins sheet 77)

(Joins sheet 85)

0 ½ 1 Mile

Scale 1:15 840

0 5000 Feet

(Joins sheet 69)

(Joins sheet 76)


(Joins sheet 86)

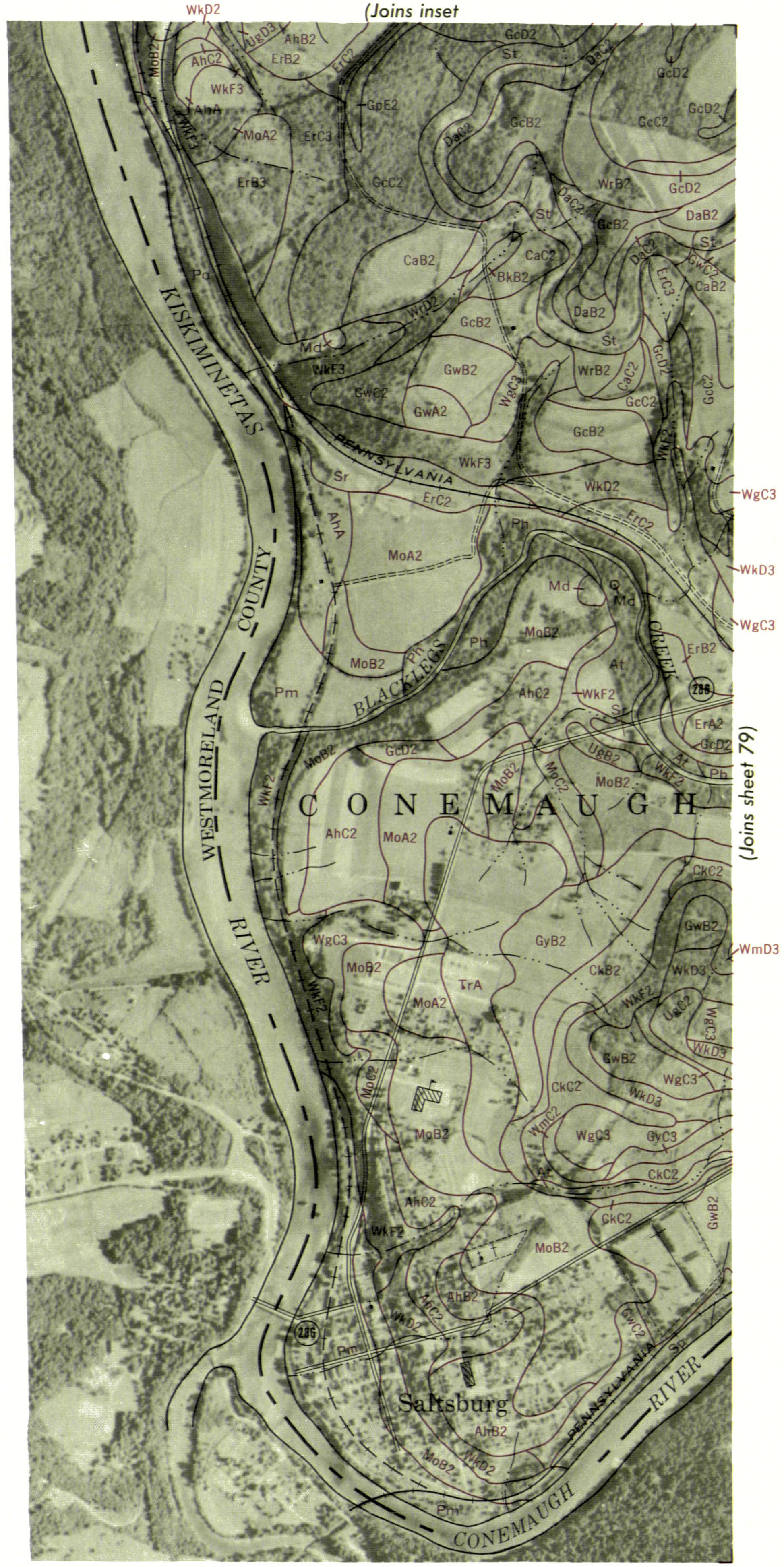
0 ½ 1 Mile

Scale 1:15 840

0 5000 Feet

This map is one of a set compiled in 1966 as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, the Pennsylvania State University, College of Agriculture and Agricultural Experiment Station, and the Pennsylvania Department of Agriculture State Soil and Water Conservation Commission.

N

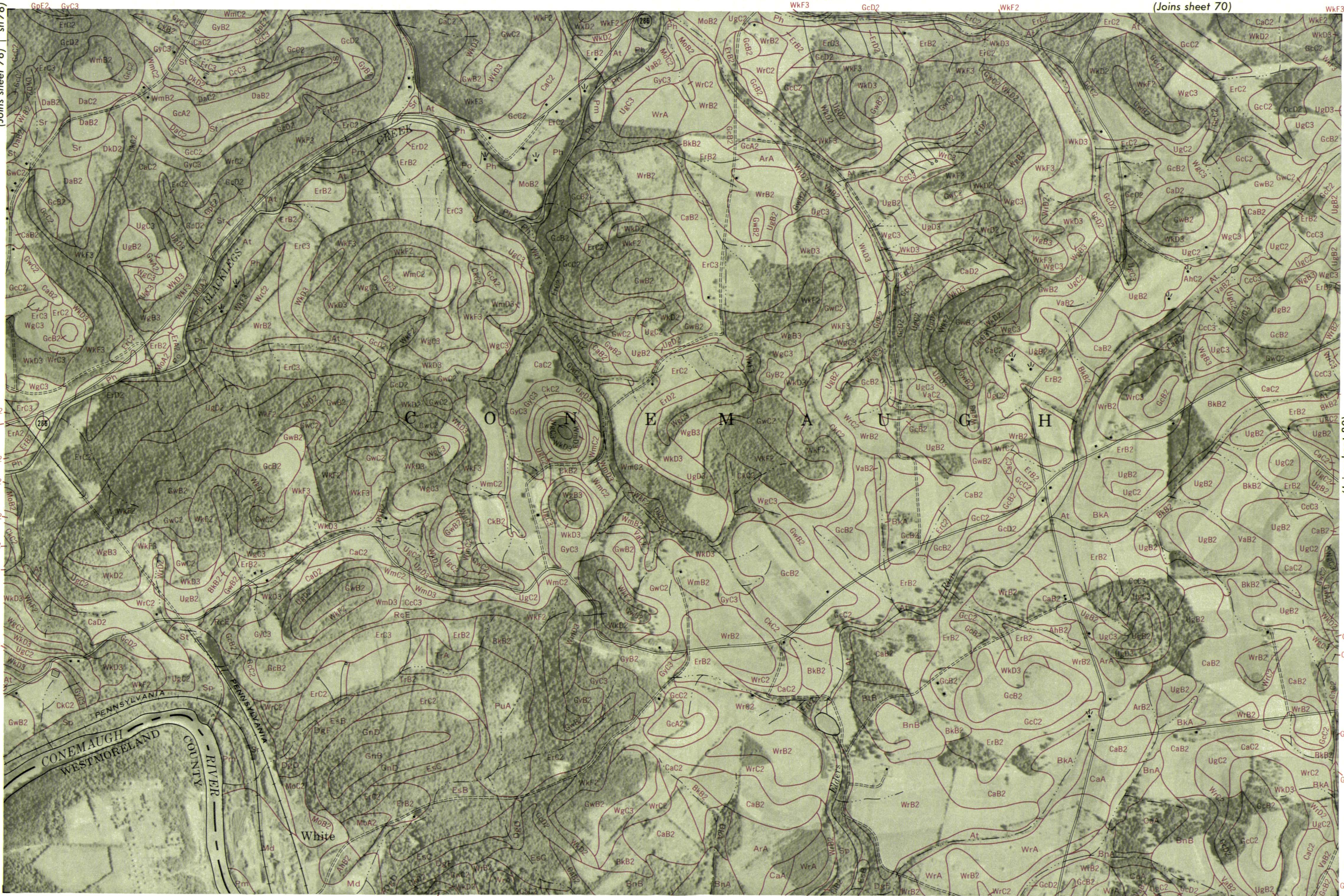




0 ½ 1 Mile Scale 1:15 840 0 5000 Feet

(Joins sheet 70)

(Inset, sh 78)

(Joins sheet 78)




(Joins sheet 80)

(Joins sheet 87)

0 ½ 1 Mile

Scale 1:15 840

0 5000 Feet

This map is one of a set compiled in 1966 as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, the Pennsylvania State University, College of Agriculture and Agricultural Experiment Station, and the Pennsylvania Department of Agriculture, State Soil and Water Conservation Commission.

8

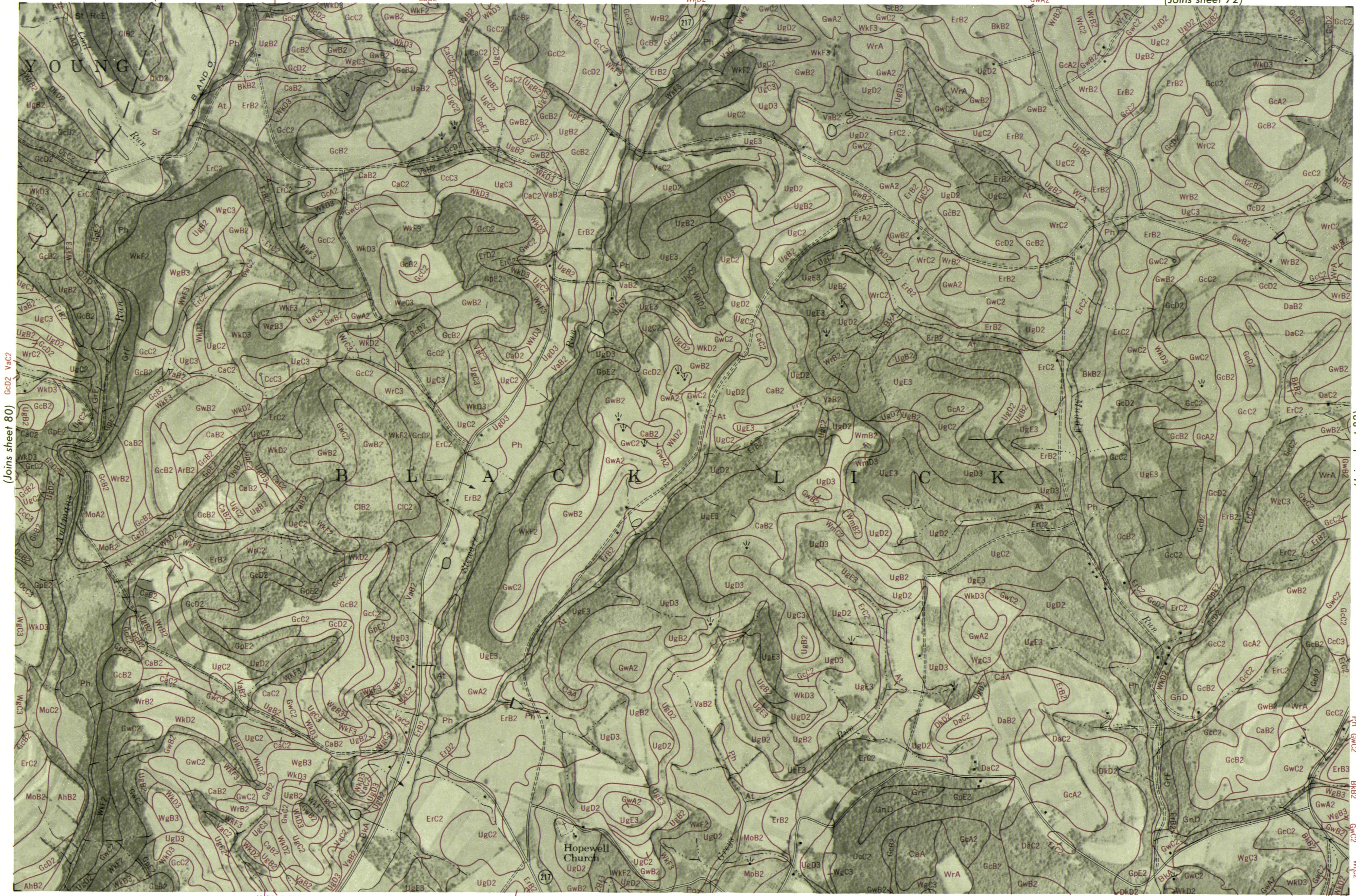
(Joins sheet 2)


(Joins sheet 14)

0 ½ 1 Mile Scale 1:15 840 0 5000 Feet


80
(Joins sheet 71)
(Joins sheet 79)
(Joins sheet 81)
(Joins sheet 88)
N
Lewisville
C O N E M A U G H
Y O U N G
B L A C K L I C K
0
½
1 Mile
Scale 1:15 840
0
5000 Feet

(Joins sheet 72)




(Joins sheet 89)

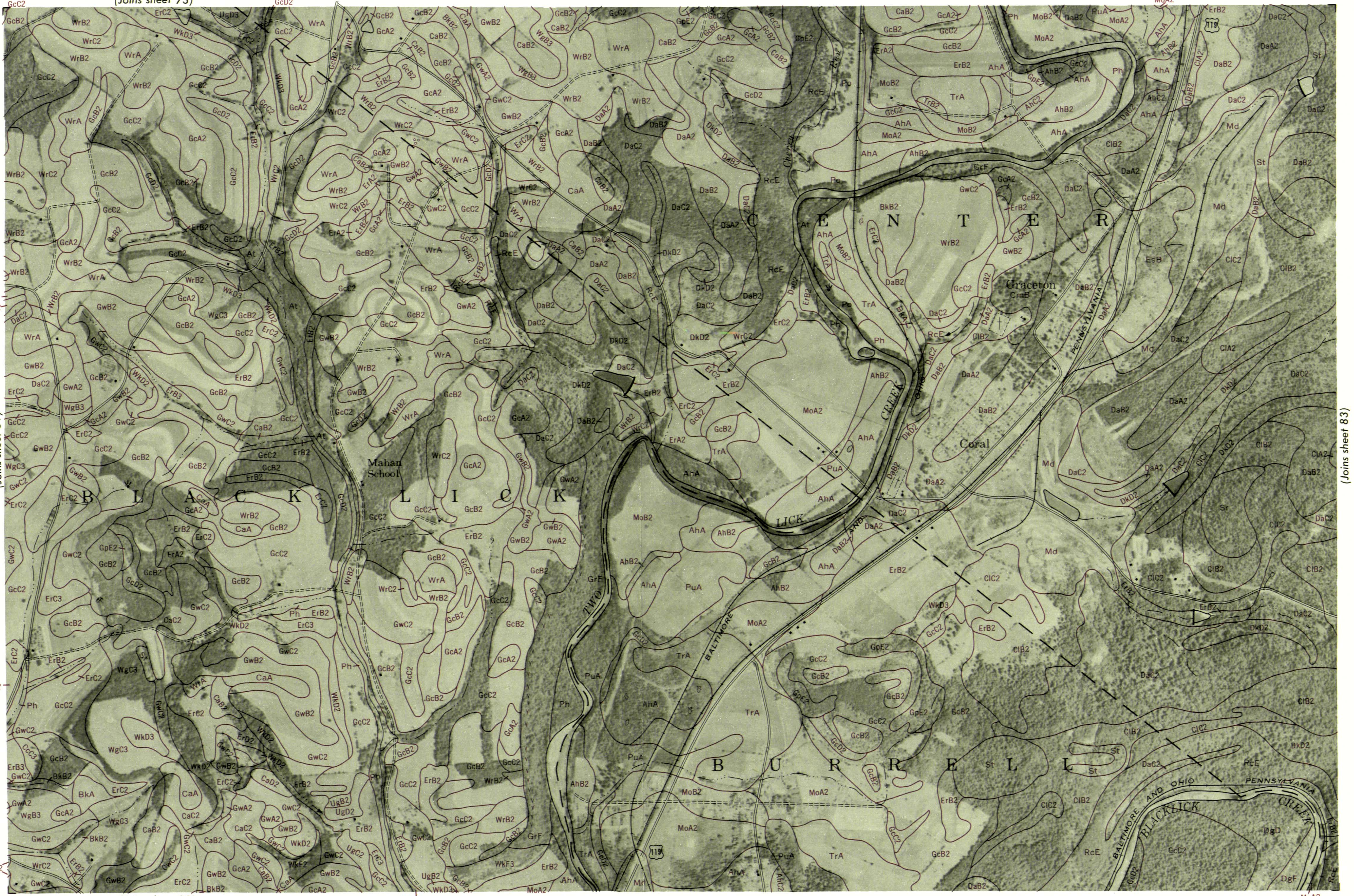
0 ½ 1 Mile Scale 1:15 840 0 5000 Feet

This map is one of a set compiled in 1966 as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, the Pennsylvania State University, College of Agriculture and Agricultural Experiment Station, and the Pennsylvania Department of Agriculture State Soil and Water Conservation Commission.

82

(Joins sheet 73)

(Joins sheet 81)




(Joins sheet 83)

(Joins sheet 90)

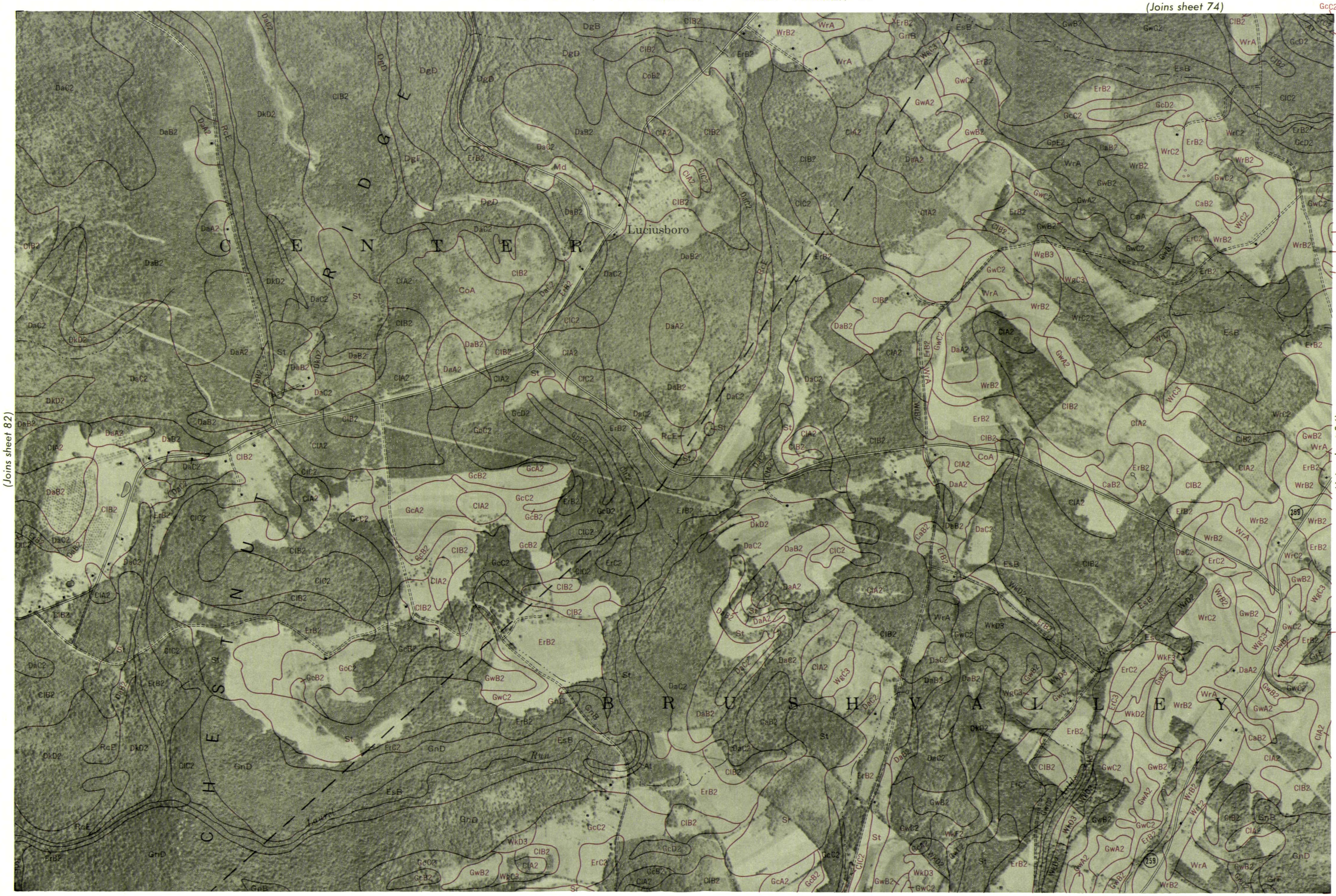
0 ½ 1 Mile

Scale 1:15 840

0 5000 Feet

(Joins sheet 74)

83




(Joins sheet 82)

(Joins sheet 84)

(Joins sheet 91)

0 ½ 1 Mile

Scale 1:15 840

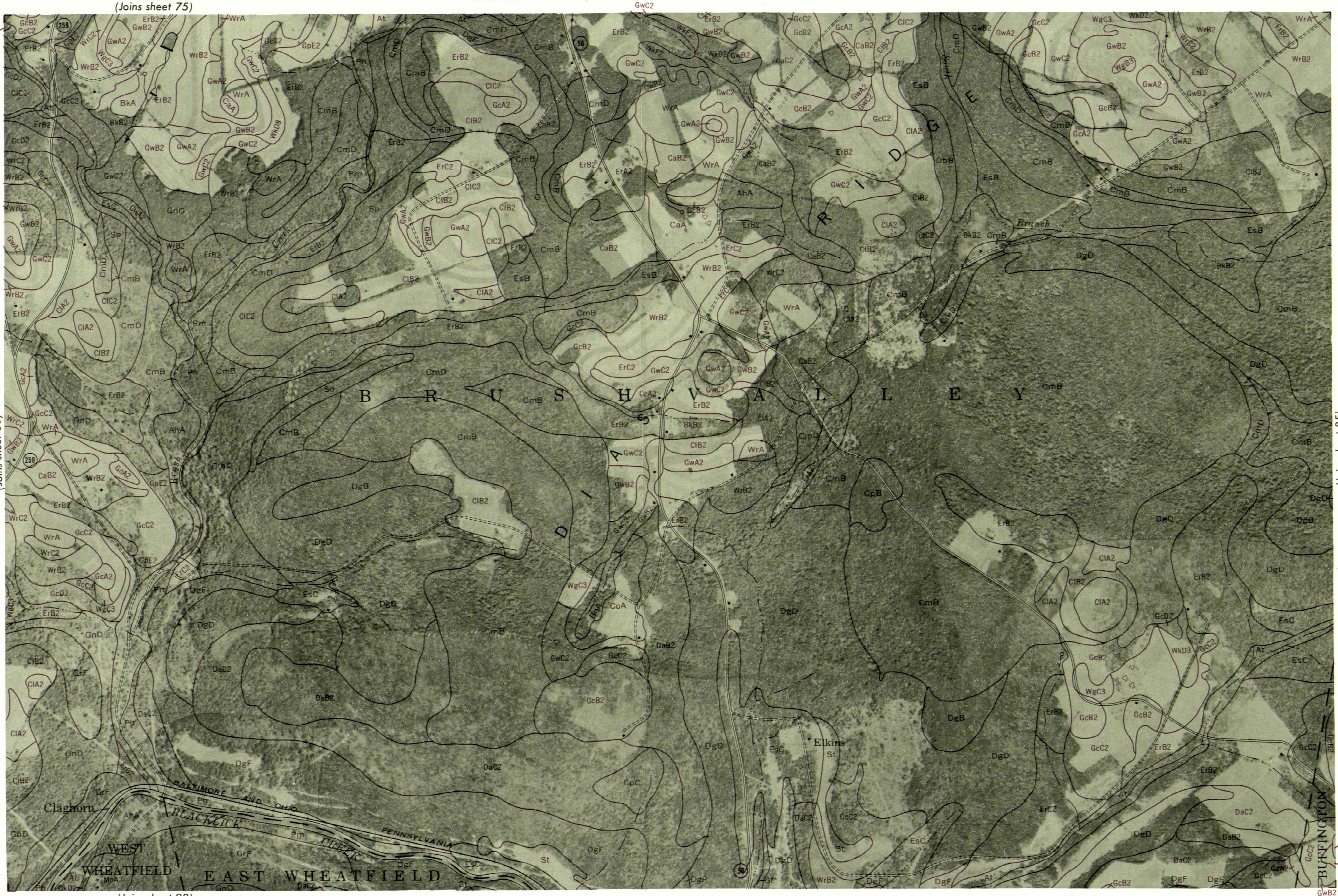
0 5000 Feet

This map is one of a set compiled in 1966 as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, the Pennsylvania State University, College of Agriculture and Agricultural Experiment Station, and the Pennsylvania Department of Agriculture State Soil and Water Conservation Commission.

84

(Joins sheet 75)

N



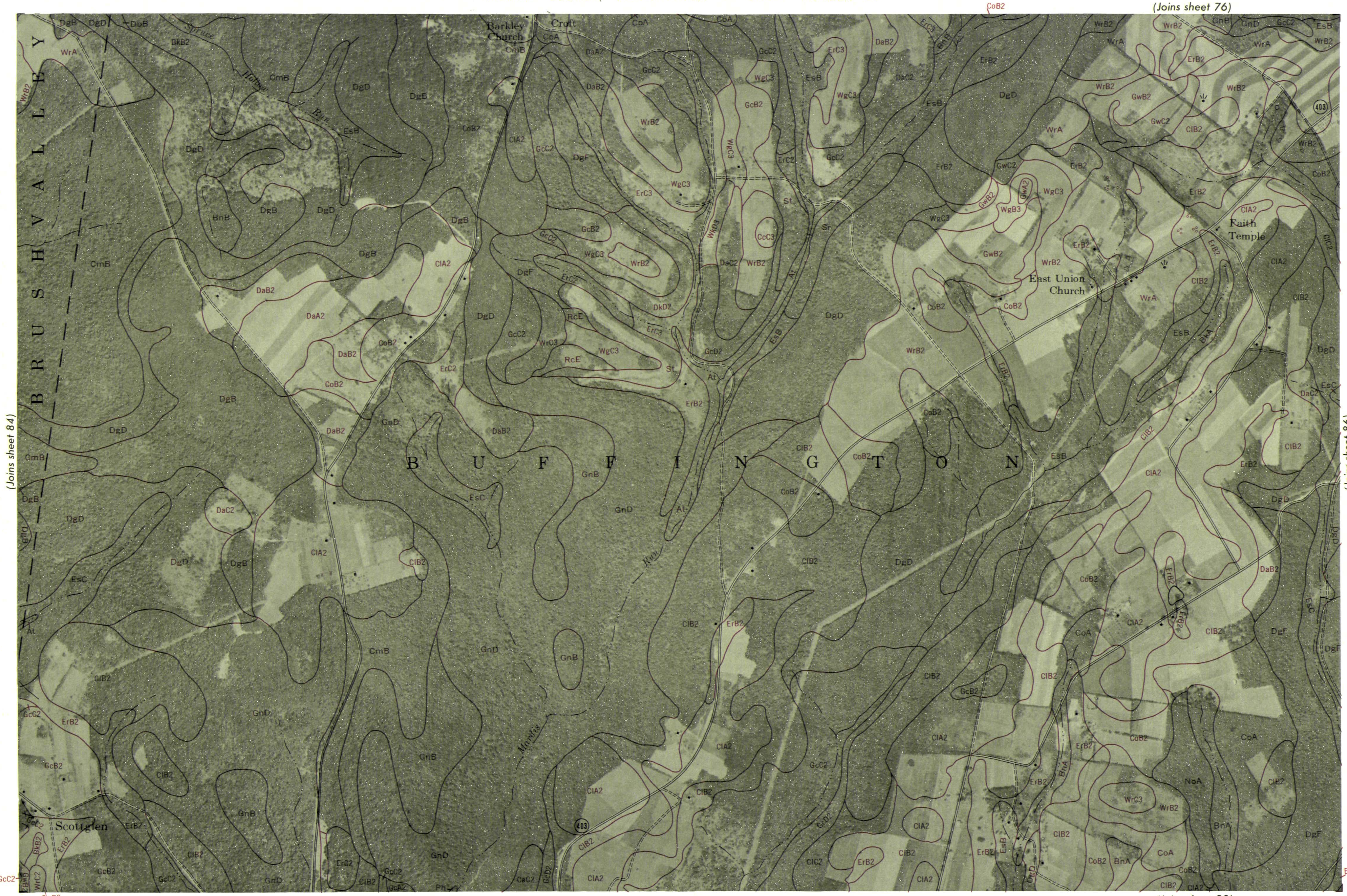

(Joins sheet 83)

(Joins sheet 85)

(Joins sheet 92)

0 ½ 1 Mile Scale 1:15 840 0 5000 Feet

(Joins sheet 76)




(Joins sheet 84)

(Joins sheet 86)

(Joins sheet 93)

0 ½ 1 Mile Scale 1:15 840 0 5000 Feet

This map is one of a set compiled in 1966 as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, the Pennsylvania State University, College of Agriculture and Agricultural Experiment Station, and the Pennsylvania Department of Agriculture State Soil and Water Conservation Commission.

N

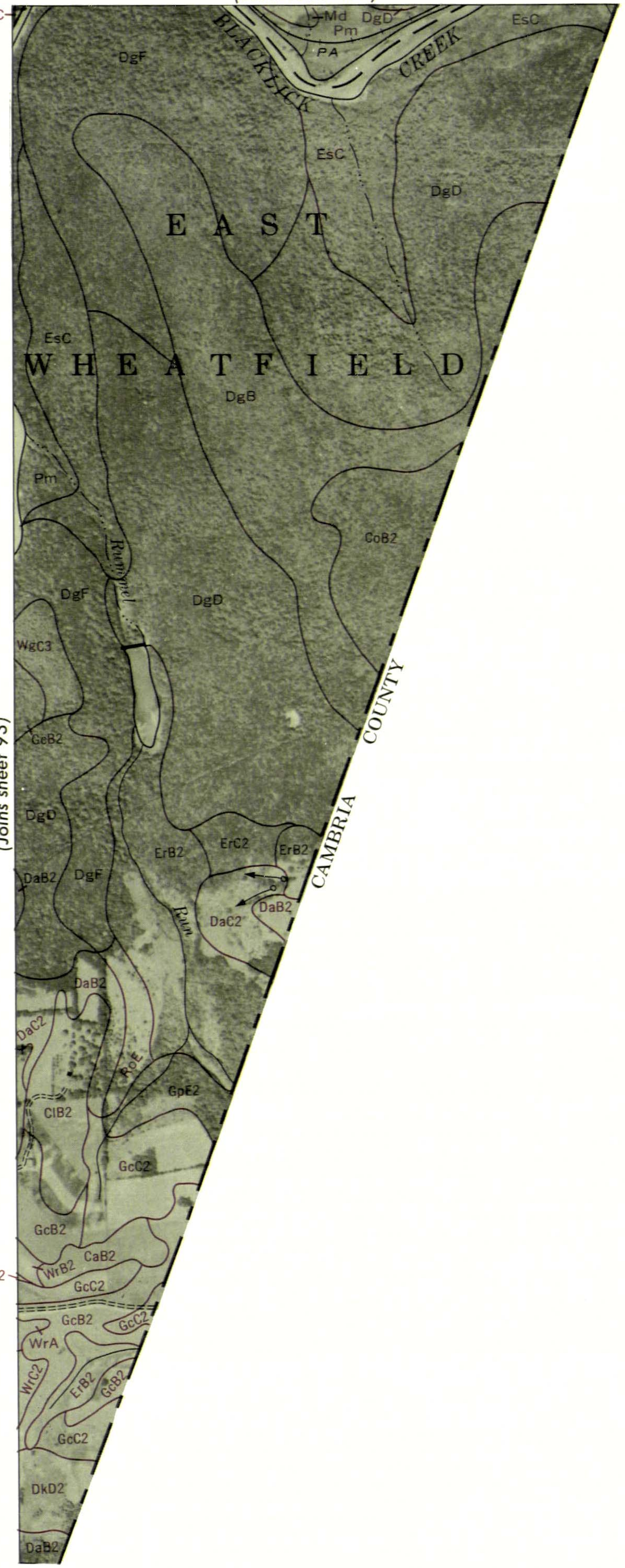
(Joins sheet 77)

(Joins sheet 85)


(Joins inset)

(Joins lower left)

(Joins sheet 93)

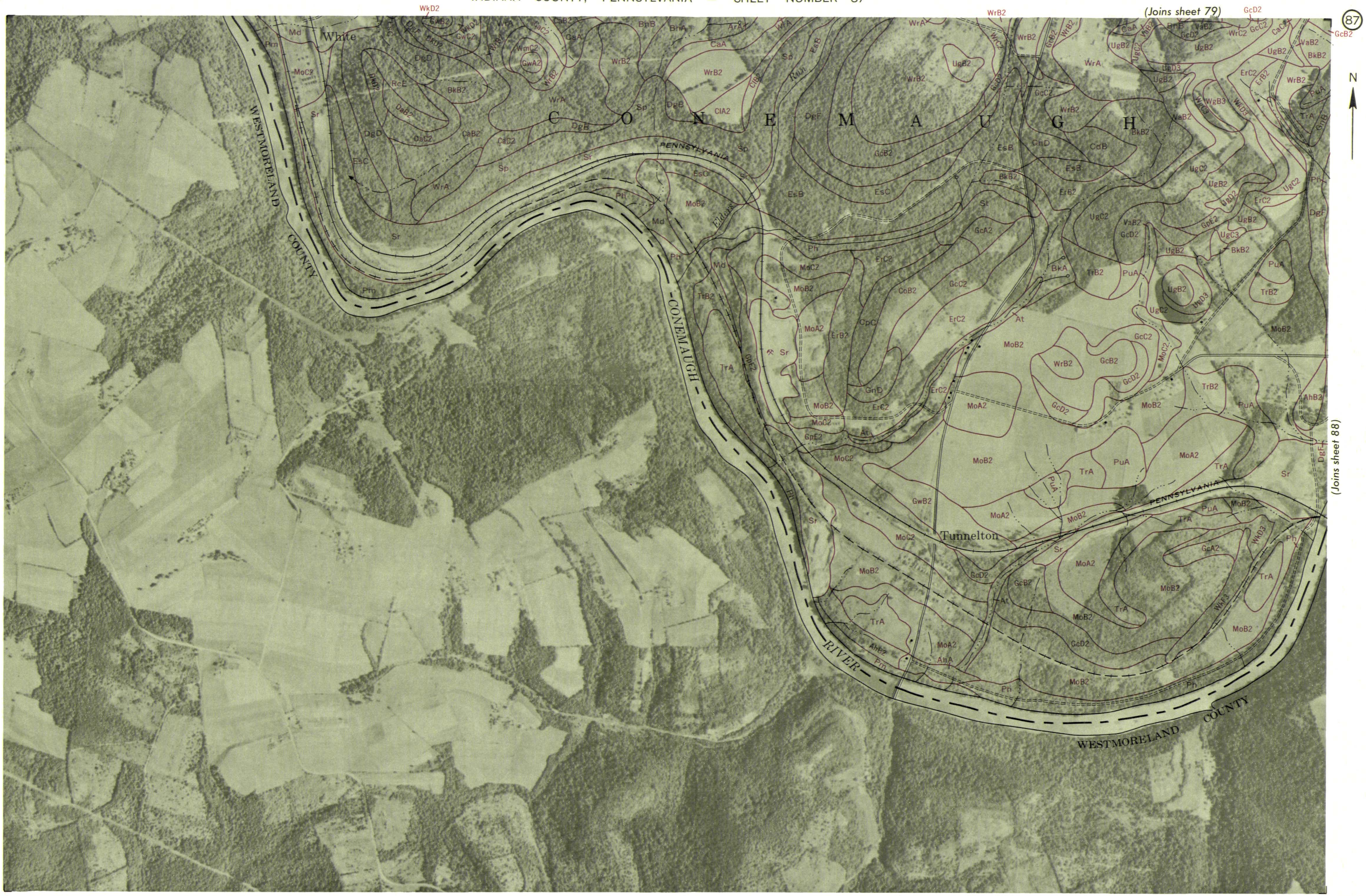



(Sh98)

0 ½ 1 Mile

Scale 1:15 840

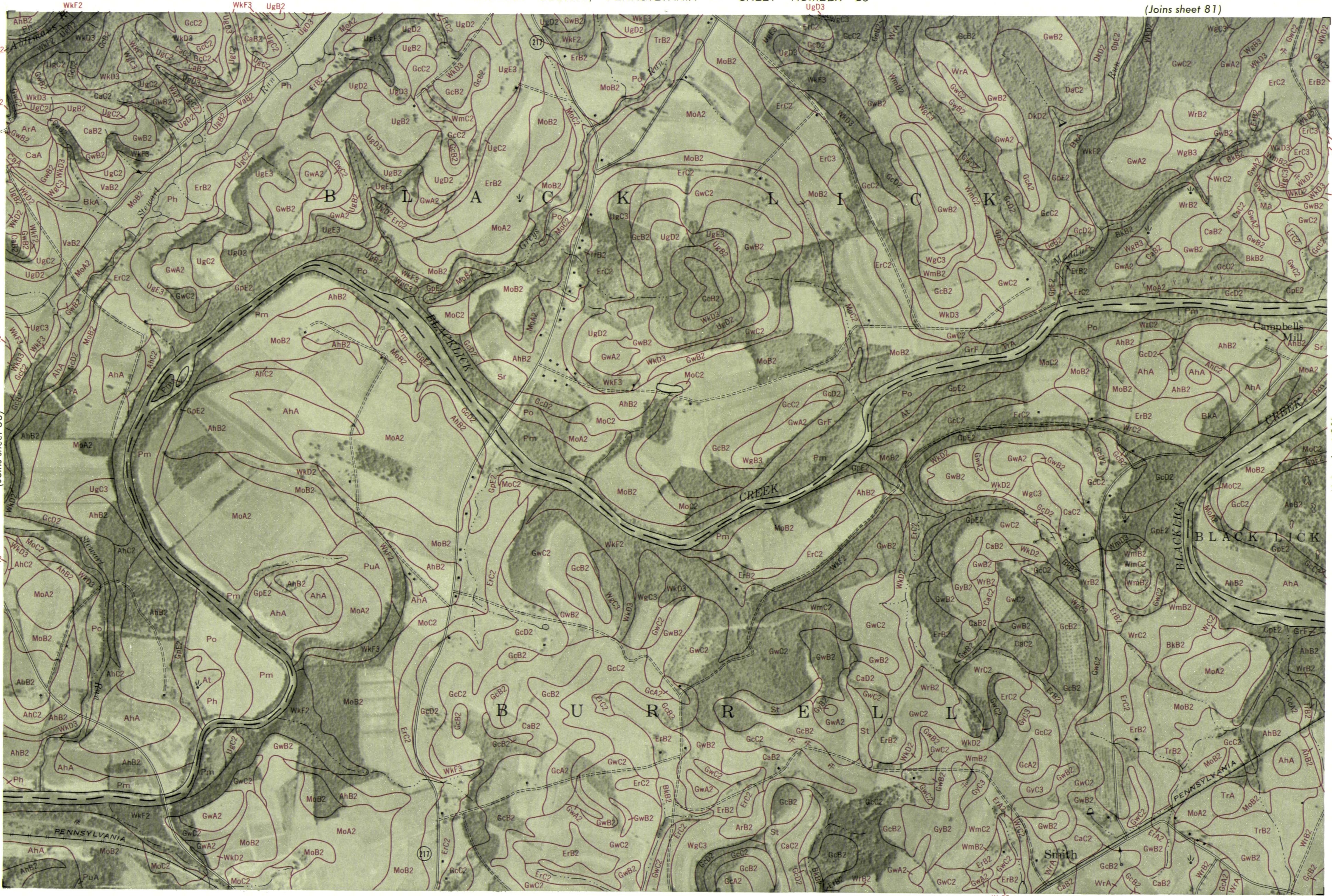
0 5000 Feet




0 ½ 1 Mile Scale 1:15 840 0 5000 Feet

This map is one of a set compiled in 1966 as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, the Pennsylvania State University, College of Agriculture and Agricultural Experiment Station, and the Pennsylvania Department of Agriculture State Soil and Water Conservation Commission.

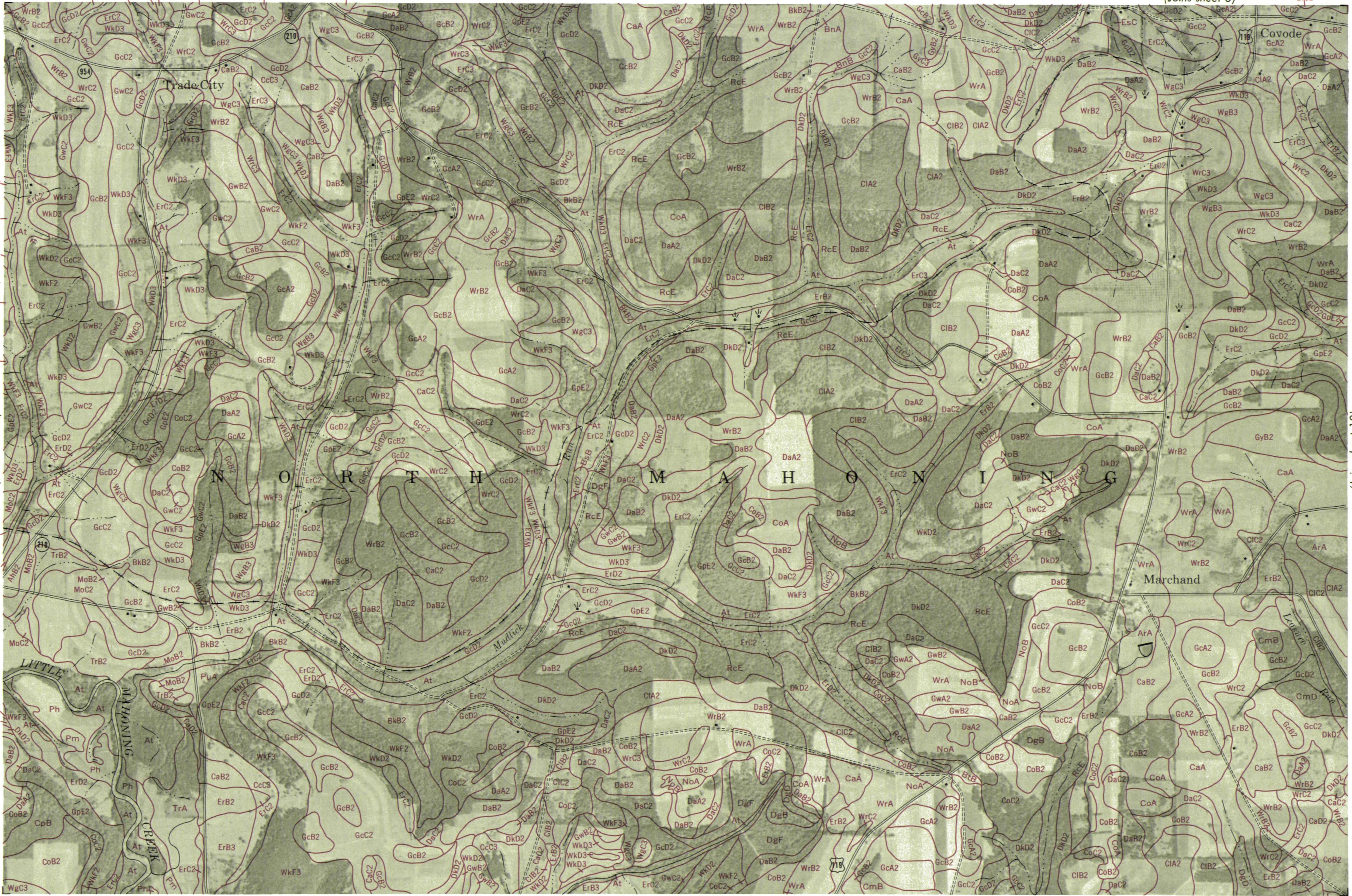

0 ½ 1 Mile
Scale 1:15 840
0 5000 Feet




This map is one of a set compiled in 1966 as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, the Pennsylvania State University, College of Agriculture and Agricultural Experiment Station, and the Pennsylvania Department of Agriculture State Soil and Water Conservation Commission.

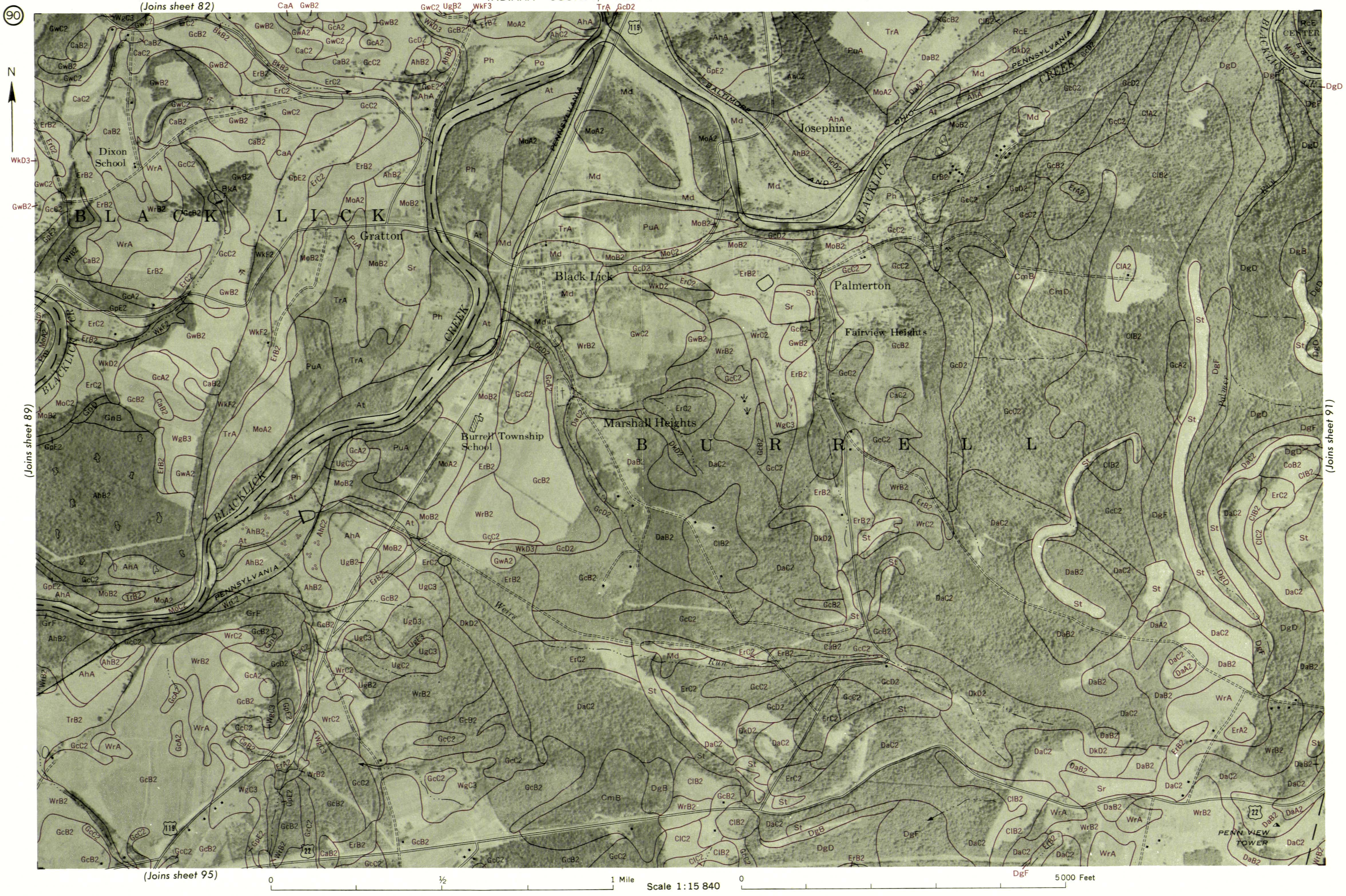
0 ½ 1 Mile Scale 1:15 840 0 5000 Feet

9



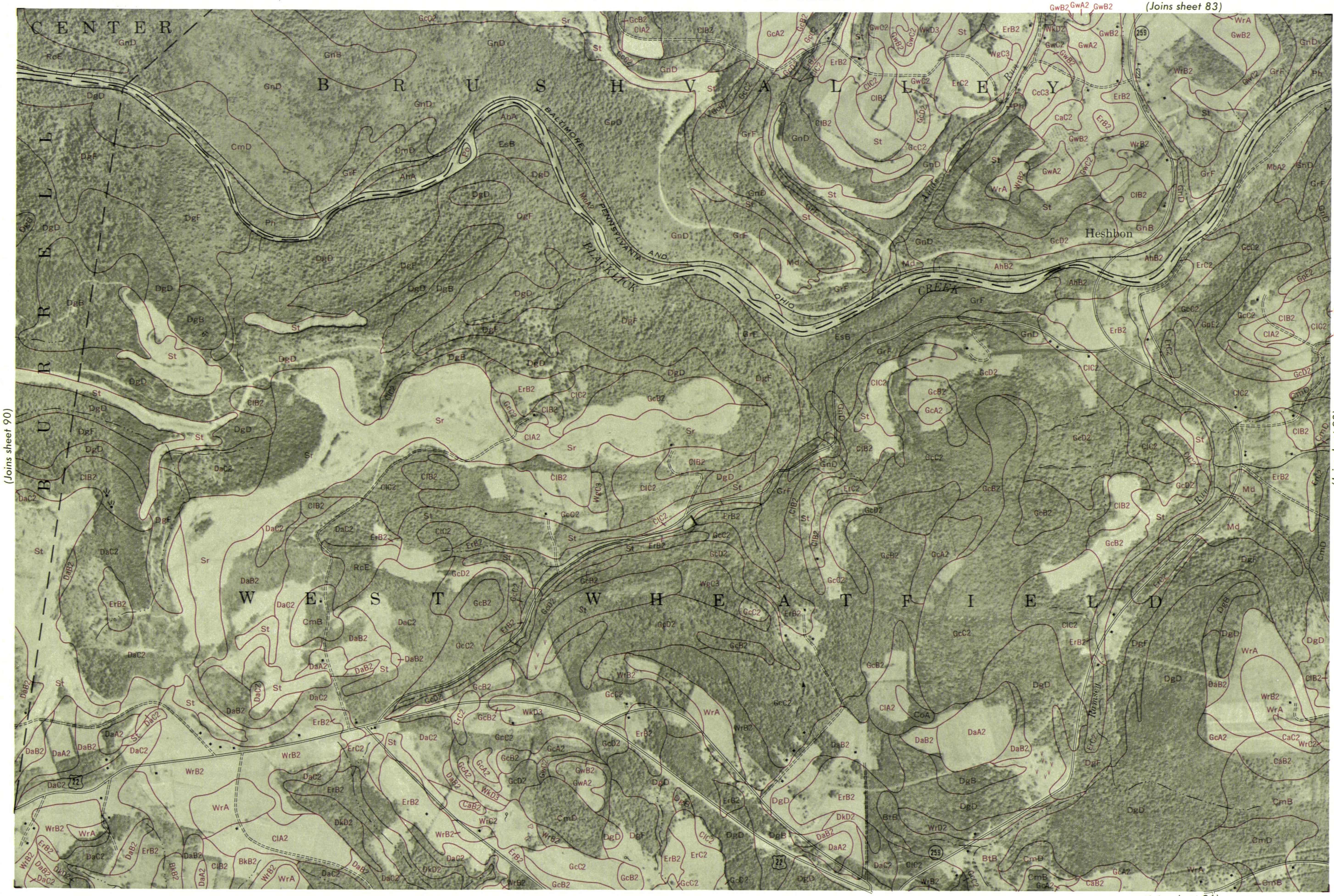

0 ½ 1 Mile Scale 1:15 840 0 5000 Feet

This map is one of a set compiled in 1966 as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, the Pennsylvania State University, College of Agriculture and Agricultural Experiment Station, and the Pennsylvania Department of Agriculture State Soil and Water Conservation Commission.


90
N
(Joins sheet 82)
(Joins sheet 89)
(Joins sheet 91)
(Joins sheet 95)
BLACKLICK
BURRELL
Dixon School
Gratton
Black Lick
Palmerton
Josephine
Fairview Heights
Marshall Heights
Burrell Township School
BLACKLICK CREEK
PENNSYLVANIA
BALTIMORE AND OHIO
Weirs Run
Palmer Run
PENN VIEW TOWER
BLACKLICK CENTER
119
22
0
½
1 Mile
Scale 1:15 840
0
5000 Feet

91

(Joins sheet 83)




(Joins sheet 90)

(Joins sheet 92)

(Joins sheet 96)

0 ½ 1 Mile

Scale 1:15 840

0 5000 Feet

This map is one of a set compiled in 1966 as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, the Pennsylvania State University, College of Agriculture and Agricultural Experiment Station, and the Pennsylvania Department of Agriculture State Soil and Water Conservation Commission.

92

(Joins sheet 84)


(Joins sheet 97)

Scale 1:15 840

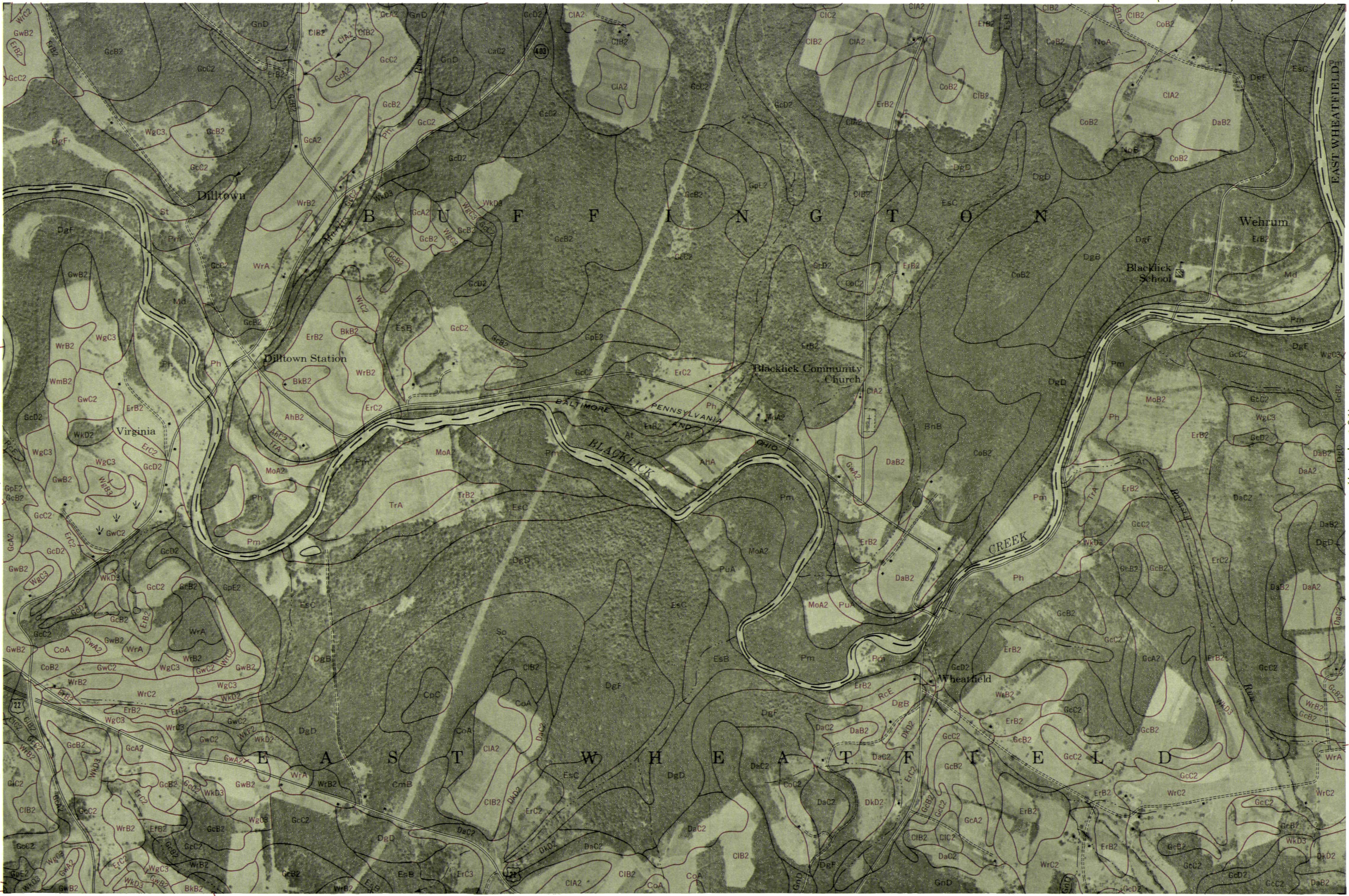
0 ½ 1 Mile

0 5000 Feet

(Joins sheet 85)



(Joins sheet 92)




(Joins sheet 86)

This map is one of a set compiled in 1966 as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, the Pennsylvania State University, College of Agriculture and Agricultural Experiment Station, and the Pennsylvania Department of Agriculture State Soil and Water Conservation Commission.

0 ½ 1 Mile Scale 1:15 840 0 5000 Feet

(Joins sheet 98)

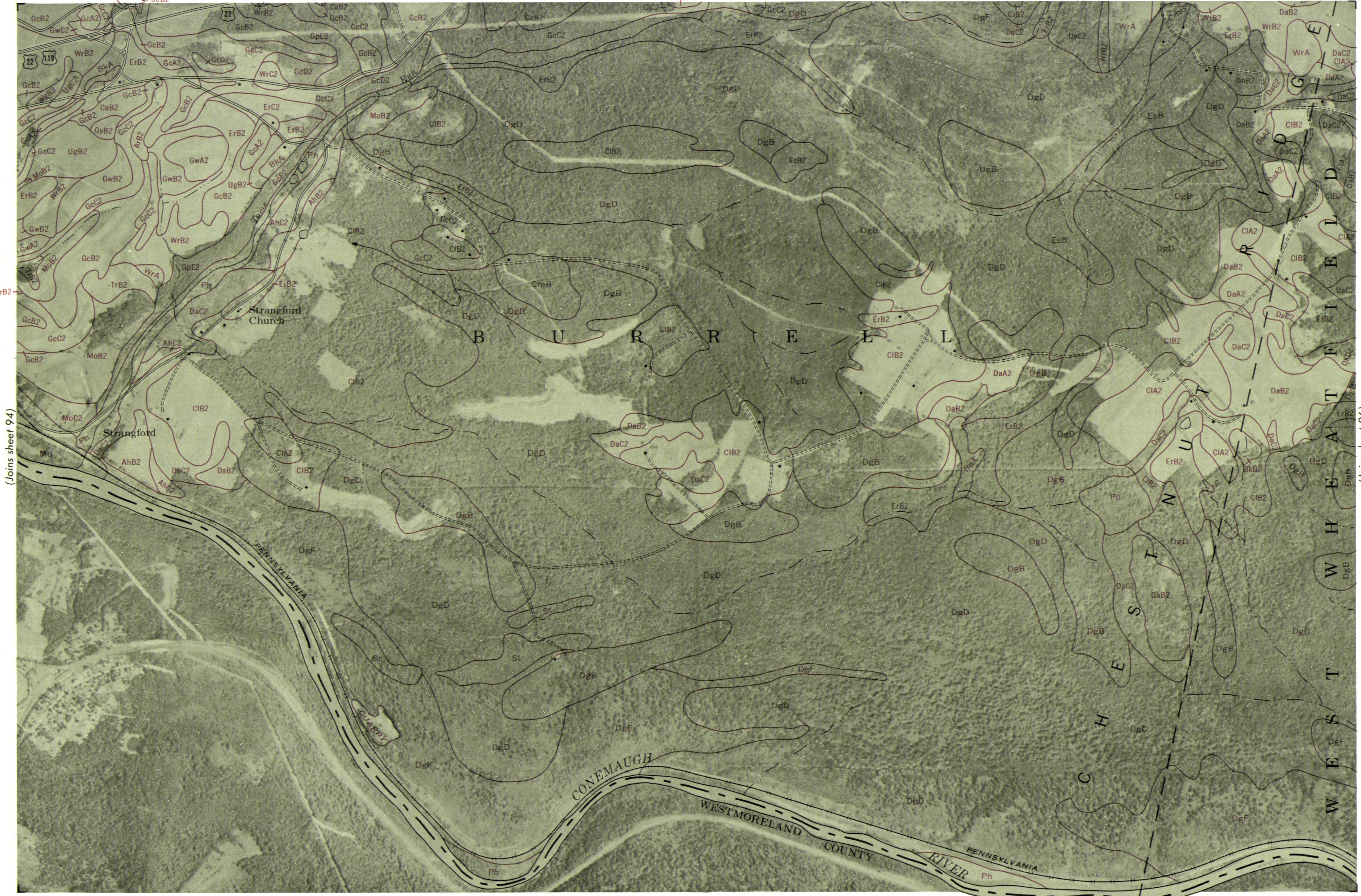

94
(Joins sheet 89)
N
(Joins inset)
Shearwood Terrace
B U R R E L L
Smith
PENNSYLVANIA
WESTMORELAND COUNTY
22
119
217
Blairsville
BLAIRSVILLE MEMORIAL PARK
FLOOD BOUNDARY AREA
CONEMAUGH RIVER
(Joins sheet 95)
(Joins sheet 88)
WESTMORELAND COUNTY
CONEMAUGH RIVER
BURRELL
(Joins upper left)
(Joins sheet 99)
WEST WHEATFIELD
0
½
1 Mile
Scale 1:15 840
0
5000 Feet

95

(Joins sheet 90)

(Joins sheet 94)

(Joins sheet 96)




0 ½ 1 Mile Scale 1:15 840 0 5000 Feet

This map is one of a set compiled in 1966 as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, the Pennsylvania State University, College of Agriculture and Agricultural Experiment Station, and the Pennsylvania Department of Agriculture State Soil and Water Conservation Commission.

*(Joins sheet 91)*

N

*(Joins sheet 95)*


*(Joins sheet 97)*

*(Joins sheet 99)*

0 ½ 1 Mile Scale 1:15 840 0 5000 Feet

(Joins sheet 92)

(Joins sheet 96)

(Joins sheet 98)


(Joins sheet 100)

0 ½ 1 Mile
Scale 1:15 840
0 5000 Feet

This map is one of a set compiled in 1966 as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, the Pennsylvania State University, College of Agriculture and Agricultural Experiment Station, and the Pennsylvania Department of Agriculture State Soil and Water Conservation Commission.

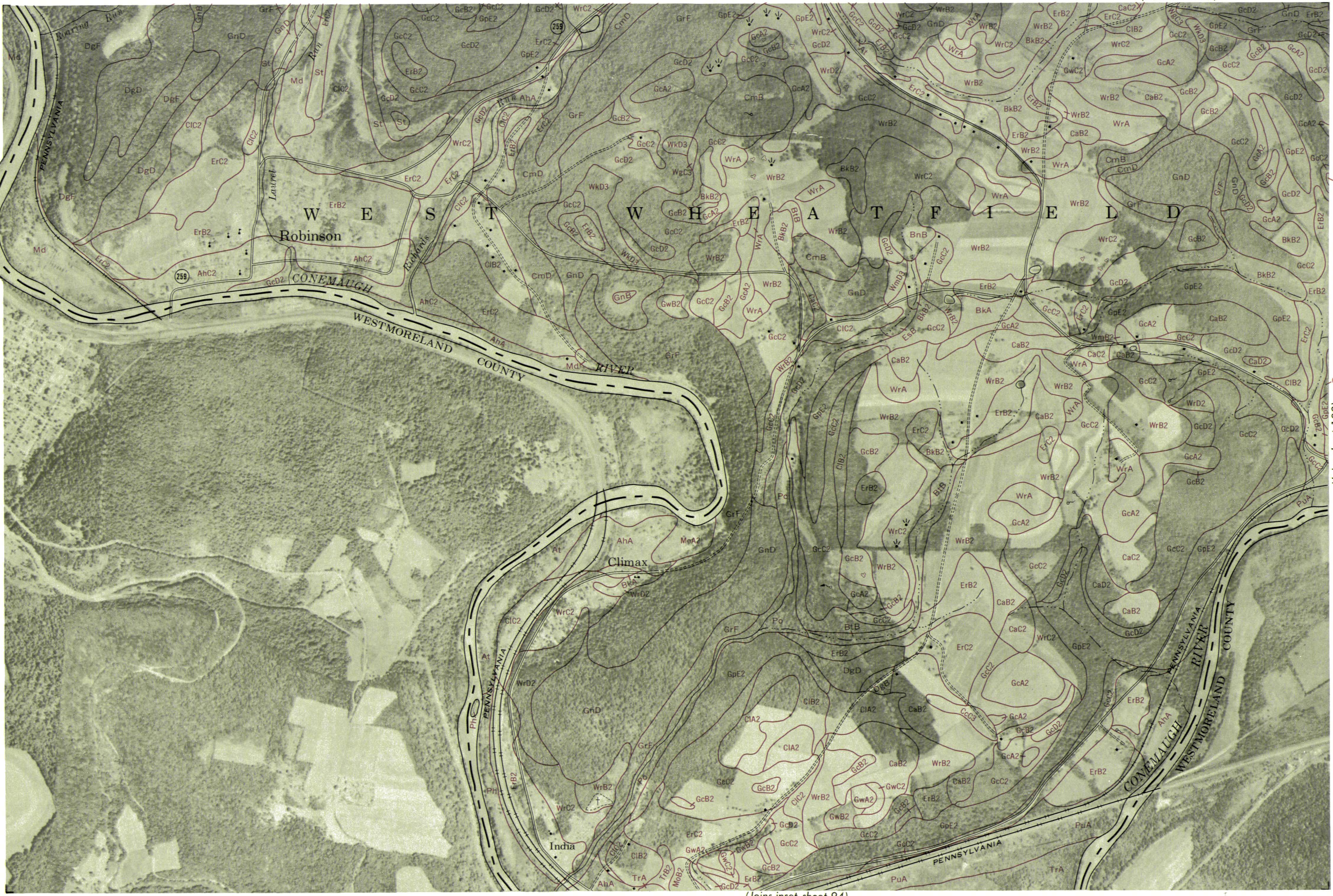
(Joins sheet 93) | (Inset, sh 86)

(Joins sheet 97)


0 ½ 1 Mile Scale 1:15 840 0 5000 Feet

(Joins inset, sheet 100)

(Joins sheet 96)




(Joins sheet 100)

(Joins inset, sheet 94)

0 ½ 1 Mile Scale 1:15 840 0 5000 Feet

This map is one of a set compiled in 1966 as part of a soil survey by the Soil Conservation Service, United States Department of Agriculture, the Pennsylvania State University, College of Agriculture and Agricultural Experiment Station, and the Pennsylvania Department of Agriculture State Soil and Water Conservation Commission.

## GUIDE TO MAPPING UNITS

[See table 1, p. 20, for estimated average yields per acre, and table 2, p. 26, for woodland interpretations. For information significant in engineering see the section beginning on p. 31. See table 8, p. 57, for the approximate acreage and proportionate extent of the soils]

| Map symbol | Mapping unit | Described on page | Capability unit | | Community development group | |
|---|---|---|---|---|---|---|
| | | | Symbol | Page | Number | Page |
| AhA | Allegheny silt loam, 0 to 3 percent slopes | 58 | I-1 | 10 | 1 | 43 |
| AhB2 | Allegheny silt loam, 3 to 8 percent slopes, moderately eroded | 59 | IIe-1 | 10 | 1 | 43 |
| AhC2 | Allegheny silt loam, 8 to 15 percent slopes, moderately eroded | 59 | IIIe-1 | 12 | 2 | 43 |
| ArA | Armagh silt loam, 0 to 3 percent slopes | 59 | IVw-1 | 16 | 14 | 56 |
| ArB2 | Armagh silt loam, 3 to 8 percent slopes, moderately eroded | 60 | IVw-2 | 16 | 14 | 56 |
| At | Atkins silt loam | 60 | VIw-1 | 17 | 15 | 56 |
| BkA | Brinkerton silt loam, 0 to 3 percent slopes | 61 | IVw-1 | 16 | 14 | 56 |
| BkB2 | Brinkerton silt loam, 3 to 8 percent slopes, moderately eroded | 61 | IVw-2 | 16 | 14 | 56 |
| BnA | Brinkerton silt loam, very wet, 0 to 3 percent slopes | 62 | IVw-1 | 16 | 14 | 56 |
| BnB | Brinkerton silt loam, very wet, 3 to 8 percent slopes | 62 | IVw-2 | 16 | 14 | 56 |
| BsB | Brinkerton very stony silt loam, 0 to 8 percent slopes | 62 | VIIs-2 | 18 | 14 | 56 |
| BtB | Brinkerton very stony silt loam, very wet, 0 to 8 percent slopes | 62 | VIIs-2 | 18 | 14 | 56 |
| CaA | Cavode silt loam, 0 to 3 percent slopes | 63 | IIIw-1 | 14 | 14 | 56 |
| CaB2 | Cavode silt loam, 3 to 8 percent slopes, moderately eroded | 63 | IIIw-2 | 14 | 14 | 56 |
| CaC2 | Cavode silt loam, 8 to 15 percent slopes, moderately eroded | 64 | IIIe-8 | 13 | 14 | 56 |
| CaD2 | Cavode silt loam, 15 to 25 percent slopes, moderately eroded | 64 | IVe-6 | 15 | 14 | 56 |
| CcC3 | Cavode silty clay loam, 8 to 15 percent slopes, severely eroded | 64 | IVe-6 | 15 | 14 | 56 |
| CdB | Cavode very stony silt loam, 0 to 8 percent slopes | 64 | VIs-3 | 17 | 14 | 56 |
| CdC | Cavode very stony silt loam, 8 to 25 percent slopes | 64 | VIs-3 | 17 | 14 | 56 |
| CkB2 | Clarksburg silt loam, 3 to 8 percent slopes, moderately eroded | 65 | IIe-4 | 11 | 12 | 55 |
| CkC2 | Clarksburg silt loam, 8 to 15 percent slopes, moderately eroded | 65 | IIIe-6 | 13 | 13 | 56 |
| ClA2 | Clymer channery loam, 0 to 5 percent slopes, moderately eroded | 66 | IIe-1 | 10 | 1 | 43 |
| ClB2 | Clymer channery loam, 5 to 12 percent slopes, moderately eroded | 66 | IIe-1 | 10 | 1 | 43 |
| ClC2 | Clymer channery loam, 12 to 20 percent slopes, moderately eroded | 66 | IIIe-1 | 12 | 2 | 43 |
| CmB | Clymer very stony loam, 0 to 12 percent slopes | 67 | VIs-1 | 17 | 3 | 43 |
| CmD | Clymer very stony loam, 12 to 35 percent slopes | 67 | VIs-1 | 17 | 4 | 54 |
| CoA | Cookport loam, 0 to 3 percent slopes | 68 | IIw-1 | 12 | 12 | 55 |
| CoB2 | Cookport loam, 3 to 8 percent slopes, moderately eroded | 68 | IIe-5 | 11 | 12 | 55 |
| CoC2 | Cookport loam, 8 to 15 percent slopes, moderately eroded | 68 | IIIe-7 | 13 | 13 | 56 |
| CpB | Cookport very stony loam, 0 to 8 percent slopes | 68 | VIs-1 | 17 | 12 | 55 |
| CpC | Cookport very stony loam, 8 to 25 percent slopes | 68 | VIs-1 | 17 | 13 | 56 |
| DaA2 | Dekalb channery sandy loam, 0 to 5 percent slopes, moderately eroded | 69 | IIs-1 | 12 | 3 | 43 |
| DaB2 | Dekalb channery sandy loam, 5 to 12 percent slopes, moderately eroded | 69 | IIe-3 | 11 | 3 | 43 |
| DaC2 | Dekalb channery sandy loam, 12 to 20 percent slopes, moderately eroded | 69 | IIIe-3 | 12 | 4 | 54 |
| DbB | Dekalb very stony sandy loam, 0 to 12 percent slopes | 70 | VIs-2 | 17 | 5 | 54 |
| DgB | Dekalb-Gilpin very stony loams, 0 to 12 percent slopes | 70 | VIs-2 | 17 | 5 | 54 |
| DgD | Dekalb-Gilpin very stony loams, 12 to 35 percent slopes | 70 | VIs-2 | 17 | 6 | 54 |
| DgF | Dekalb-Gilpin very stony loams, 35 to 100 percent slopes | 70 | VIIs-1 | 17 | 11 | 55 |
| DkD2 | Dekalb and Ramsey channery sandy loams, 20 to 35 percent slopes, moderately eroded | 70 | IVe-1 | 14 | 11 | 55 |
| DrD | Dekalb and Ramsey very stony sandy loams, 12 to 35 percent slopes | 70 | VIs-2 | 17 | 6 | 54 |
| ErA2 | Ernest silt loam, 0 to 3 percent slopes, moderately eroded | 71 | IIw-1 | 12 | 12 | 55 |
| ErB2 | Ernest silt loam, 3 to 8 percent slopes, moderately eroded | 71 | IIe-5 | 11 | 12 | 55 |
| ErB3 | Ernest silt loam, 3 to 8 percent slopes, severely eroded | 71 | IIIe-7 | 13 | 12 | 55 |
| ErC2 | Ernest silt loam, 8 to 15 percent slopes, moderately eroded | 72 | IIIe-7 | 13 | 13 | 56 |
| ErC3 | Ernest silt loam, 8 to 15 percent slopes, severely eroded | 72 | IVe-5 | 15 | 13 | 56 |
| ErD2 | Ernest silt loam, 15 to 25 percent slopes, moderately eroded | 72 | IVe-5 | 15 | 13 | 56 |
| B | Ernest very stony silt loam, 0 to 8 percent slopes | 72 | VIs-1 | 17 | 12 | 55 |
| C | Ernest very stony silt loam, 8 to 25 percent slopes | 72 | VIs-1 | 17 | 13 | 56 |
| A2 | Gilpin channery silt loam, 0 to 5 percent slopes, moderately eroded | 73 | IIs-1 | 12 | 3 | 43 |
| GcB2 | Gilpin channery silt loam, 5 to 12 percent slopes, moderately eroded | 73 | IIe-3 | 11 | 3 | 43 |
| GcC2 | Gilpin channery silt loam, 12 to 20 percent slopes, moderately eroded | 74 | IIIe-3 | 12 | 4 | 54 |
| GcD2 | Gilpin channery silt loam, 20 to 35 percent slopes, moderately eroded | 74 | IVe-1 | 14 | 11 | 55 |
| GnB | Gilpin very stony silt loam, 0 to 12 percent slopes | 74 | VIs-2 | 17 | 5 | 54 |
| GnD | Gilpin very stony silt loam, 12 to 35 percent slopes | 74 | VIs-2 | 17 | 6 | 54 |
| GpE2 | Gilpin and Weikert channery silt loams, 35 to 70 percent slopes, moderately eroded | 74 | VIIe-1 | 17 | 11 | 55 |

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| Map symbol | Mapping unit | Described on page | Capability unit Symbol | Capability unit Page | Community development group Number | Community development group Page |
|---|---|---|---|---|---|---|
| GrF | Gilpin and Weikert very stony silt loams, 35 to 100 percent slopes | 74 | VIIs-1 | 17 | 11 | 55 |
| GwA2 | Gilpin-Weikert shaly silt loams, 0 to 5 percent slopes, moderately eroded | 74 | IIIs-1 | 14 | 9 | 55 |
| GwB2 | Gilpin-Weikert shaly silt loams, 5 to 12 percent slopes, moderately eroded | 75 | IIIe-5 | 13 | 9 | 55 |
| GwC2 | Gilpin-Weikert shaly silt loams, 12 to 20 percent slopes, moderately eroded | 75 | IVe-3 | 15 | 10 | 55 |
| GyB2 | Guernsey silt loam, 3 to 8 percent slopes, moderately eroded | 76 | IIe-4 | 11 | 12 | 55 |
| GyC3 | Guernsey silt loam, 8 to 15 percent slopes, severely eroded | 76 | IVe-4 | 15 | 13 | 56 |
| Ma | Made land | 76 | IVs-2 &<br>VIIIs-1 | 16<br>18 | 16 | 56 |
| Md | Mine dumps | 76 | VIIIs-1 | 18 | 16 | 56 |
| MoA2 | Monongahela silt loam, 0 to 3 percent slopes, moderately eroded | 77 | IIw-1 | 12 | 12 | 55 |
| MoB2 | Monongahela silt loam, 3 to 8 percent slopes, moderately eroded | 77 | IIe-5 | 11 | 12 | 55 |
| MoC2 | Monongahela silt loam, 8 to 15 percent slopes, moderately eroded | 78 | IIIe-7 | 13 | 13 | 56 |
| NoA | Nolo silt loam, 0 to 3 percent slopes | 78 | IVw-1 | 16 | 14 | 56 |
| NoB | Nolo silt loam, 3 to 8 percent slopes | 79 | IVw-2 | 16 | 14 | 56 |
| Ph | Philo silt loam | 79 | IIw-2 | 12 | 15 | 56 |
| Pm | Pope fine sandy loam | 80 | I-2 | 10 | 15 | 56 |
| Po | Pope silt loam | 80 | I-2 | 10 | 15 | 56 |
| PuA | Purdy silt loam, 0 to 5 percent slopes | 81 | IVw-1 | 16 | 14 | 56 |
| RcE | Ramsey and Dekalb channery sandy loams, 35 to 70 percent slopes | 81 | VIIe-1 | 17 | 11 | 55 |
| RdF | Ramsey and Dekalb very stony sandy loams, 35 to 100 percent slopes | 82 | VIIs-1 | 17 | 11 | 55 |
| So | Stony land, sloping | 82 | VIIIs-1 | 18 | 16 | 56 |
| Sp | Stony land, steep | 82 | VIIIs-1 | 18 | 16 | 56 |
| Sr | Strip mine spoil, sloping | 82 | IVs-1,<br>VIIs-3, &<br>VIIIs-1 | 16<br>18<br>18 | 16 | 56 |
| St | Strip mine spoil, steep | 82 | VIIs-3 &<br>VIIIs-1 | 18<br>18 | 16 | 56 |
| TrA | Tygart silt loam, 0 to 3 percent slopes | 83 | IIIw-1 | 14 | 14 | 56 |
| TrB2 | Tygart silt loam, 3 to 8 percent slopes, moderately eroded | 83 | IIIw-2 | 14 | 14 | 56 |
| UgB2 | Upshur-Gilpin silty clay loams, 3 to 8 percent slopes, moderately eroded | 84 | IIIe-4 | 13 | 7 | 54 |
| UgC2 | Upshur-Gilpin silty clay loams, 8 to 15 percent slopes, moderately eroded | 84 | IVe-2 | 15 | 8 | 55 |
| UgC3 | Upshur-Gilpin silty clay loams, 8 to 15 percent slopes, severely eroded | 84 | IVe-2 | 15 | 8 | 55 |
| UgD2 | Upshur-Gilpin silty clay loams, 15 to 25 percent slopes, moderately eroded | 84 | VIe-2 | 16 | 8 | 55 |
| UgD3 | Upshur-Gilpin silty clay loams, 15 to 25 percent slopes, severely eroded | 85 | VIe-2 | 16 | 8 | 55 |
| UgE3 | Upshur-Gilpin silty clay loams, 25 to 45 percent slopes, severely eroded | 85 | VIIe-2 | 17 | 11 | 55 |
| VaB2 | Vandergrift silt loam, 3 to 8 percent slopes, moderately eroded | 86 | IIe-4 | 11 | 12 | 55 |
| VaC2 | Vandergrift silt loam, 8 to 15 percent slopes, moderately eroded | 86 | IIIe-6 | 13 | 12 | 55 |
| WgB3 | Weikert-Gilpin shaly silt loams, 5 to 12 percent slopes, severely eroded | 86 | IVe-3 | 15 | 9 | 55 |
| WgC3 | Weikert-Gilpin shaly silt loams, 12 to 20 percent slopes, severely eroded | 86 | VIe-3 | 17 | 10 | 55 |
| WkD2 | Weikert and Gilpin shaly silt loams, 20 to 35 percent slopes, moderately eroded | 87 | VIe-3 | 17 | 11 | 55 |
| WkD3 | Weikert and Gilpin shaly silt loams, 20 to 35 percent slopes, severely eroded | 87 | VIIe-2 | 17 | 11 | 55 |
| WkF2 | Weikert and Gilpin shaly silt loams, 35 to 100 percent slopes, moderately eroded | 87 | VIIe-2 | 17 | 11 | 55 |
| WkF3 | Weikert and Gilpin shaly silt loams, 35 to 100 percent slopes, severely eroded | 87 | VIIe-2 | 17 | 11 | 55 |
| WmB2 | Westmoreland silt loam, 5 to 12 percent slopes, moderately eroded | 88 | IIe-2 | 11 | 3 | 43 |
| WmC2 | Westmoreland silt loam, 12 to 20 percent slopes, moderately eroded | 88 | IIIe-2 | 12 | 4 | 54 |
| WmD3 | Westmoreland silt loam, 20 to 35 percent slopes, severely eroded | 88 | VIe-1 | 16 | 11 | 55 |
| WrA | Wharton silt loam, 0 to 3 percent slopes | 89 | IIw-1 | 12 | 12 | 55 |
| WrB2 | Wharton silt loam, 3 to 8 percent slopes, moderately eroded | 89 | IIe-5 | 11 | 12 | 55 |
| WrC2 | Wharton silt loam, 8 to 15 percent slopes, moderately eroded | 89 | IIIe-7 | 13 | 13 | 56 |
| WrC3 | Wharton silt loam, 8 to 15 percent slopes, severely eroded | 90 | IVe-5 | 15 | 13 | 56 |
| WrD2 | Wharton silt loam, 15 to 25 percent slopes, moderately eroded | 90 | IVe-5 | 15 | 13 | 56 |

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# SOIL LEGEND

The first capital letter is the initial one of the soil name. A second capital letter, A, B, C, D, E, or F shows the slope. Most symbols without a slope letter are those of nearly level soils. Soils that are named as moderately eroded or severely eroded have a final number, 2 or 3, in their symbol.

| SYMBOL | NAME |
|---|---|
| AhA | Allegheny silt loam, 0 to 3 percent slopes |
| AhB2 | Allegheny silt loam, 3 to 8 percent slopes, moderately eroded |
| AhC2 | Allegheny silt loam, 8 to 15 percent slopes, moderately eroded |
| ArA | Armagh silt loam, 0 to 3 percent slopes |
| ArB2 | Armagh silt loam, 3 to 8 percent slopes, moderately eroded |
| At | Atkins silt loam |
| BkA | Brinkerton silt loam, 0 to 3 percent slopes |
| BkB2 | Brinkerton silt loam, 3 to 8 percent slopes, moderately eroded |
| BnA | Brinkerton silt loam, very wet, 0 to 3 percent slopes |
| BnB | Brinkerton silt loam, very wet, 3 to 8 percent slopes |
| BsB | Brinkerton very stony silt loam, 0 to 8 percent slopes |
| BtB | Brinkerton very stony silt loam, very wet, 0 to 8 percent slopes |
| CaA | Cavode silt loam, 0 to 3 percent slopes |
| CaB2 | Cavode silt loam, 3 to 8 percent slopes, moderately eroded |
| CaC2 | Cavode silt loam, 8 to 15 percent slopes, moderately eroded |
| CaD2 | Cavode silt loam, 15 to 25 percent slopes, moderately eroded |
| CcC3 | Cavode silty clay loam, 8 to 15 percent slopes, severely eroded |
| CdB | Cavode very stony silt loam, 0 to 8 percent slopes |
| CdC | Cavode very stony silt loam, 8 to 25 percent slopes |
| CkB2 | Clarksburg silt loam, 3 to 8 percent slopes, moderately eroded |
| CkC2 | Clarksburg silt loam, 8 to 15 percent slopes, moderately eroded |
| ClA2 | Clymer channery loam, 0 to 5 percent slopes, moderately eroded |
| ClB2 | Clymer channery loam, 5 to 12 percent slopes, moderately eroded |
| ClC2 | Clymer channery loam, 12 to 20 percent slopes, moderately eroded |
| CmB | Clymer very stony loam, 0 to 12 percent slopes |
| CmD | Clymer very stony loam, 12 to 35 percent slopes |
| CoA | Cookport loam, 0 to 3 percent slopes |
| CoB2 | Cookport loam, 3 to 8 percent slopes, moderately eroded |
| CoC2 | Cookport loam, 8 to 15 percent slopes, moderately eroded |
| CpB | Cookport very stony loam, 0 to 8 percent slopes |
| CpC | Cookport very stony loam, 8 to 25 percent slopes |
| DaA2 | Dekalb channery sandy loam, 0 to 5 percent slopes, moderately eroded |
| DaB2 | Dekalb channery sandy loam, 5 to 12 percent slopes, moderately eroded |
| DaC2 | Dekalb channery sandy loam, 12 to 20 percent slopes, moderately eroded |
| DbB | Dekalb very stony sandy loam, 0 to 12 percent slopes |
| DgB | Dekalb–Gilpin very stony loams, 0 to 12 percent slopes |
| DgD | Dekalb–Gilpin very stony loams, 12 to 35 percent slopes |
| DgF | Dekalb–Gilpin very stony loams, 35 to 100 percent slopes |
| DkD2 | Dekalb and Ramsey channery sandy loams, 20 to 35 percent slopes, moderately eroded |
| DrD | Dekalb and Ramsey very stony sandy loams, 12 to 35 percent slopes |
| ErA2 | Ernest silt loam, 0 to 3 percent slopes, moderately eroded |
| ErB2 | Ernest silt loam, 3 to 8 percent slopes, moderately eroded |
| ErB3 | Ernest silt loam, 3 to 8 percent slopes, severely eroded |
| ErC2 | Ernest silt loam, 8 to 15 percent slopes, moderately eroded |
| ErC3 | Ernest silt loam, 8 to 15 percent slopes, severely eroded |
| ErD2 | Ernest silt loam, 15 to 25 percent slopes, moderately eroded |
| EsB | Ernest very stony silt loam, 0 to 8 percent slopes |
| EsC | Ernest very stony silt loam, 8 to 25 percent slopes |
| GcA2 | Gilpin channery silt loam, 0 to 5 percent slopes, moderately eroded |
| GcB2 | Gilpin channery silt loam, 5 to 12 percent slopes, moderately eroded |
| GcC2 | Gilpin channery silt loam, 12 to 20 percent slopes, moderately eroded |
| GcD2 | Gilpin channery silt loam, 20 to 35 percent slopes, moderately eroded |
| GnB | Gilpin very stony silt loam, 0 to 12 percent slopes |
| GnD | Gilpin very stony silt loam, 12 to 35 percent slopes |
| GpE2 | Gilpin and Weikert channery silt loams, 35 to 70 percent slopes, moderately eroded |
| GrF | Gilpin and Weikert very stony silt loams, 35 to 100 percent slopes |
| GwA2 | Gilpin–Weikert shaly silt loams, 0 to 5 percent slopes, moderately eroded |
| GwB2 | Gilpin–Weikert shaly silt loams, 5 to 12 percent slopes, moderately eroded |
| GwC2 | Gilpin–Weikert shaly silt loams, 12 to 20 percent slopes, moderately eroded |
| GyB2 | Guernsey silt loam, 3 to 8 percent slopes, moderately eroded |
| GyC3 | Guernsey silt loam, 8 to 15 percent slopes, severely eroded |
| Ma | Made land |
| Md | Mine dumps |
| MoA2 | Monongahela silt loam, 0 to 3 percent slopes, moderately eroded |
| MoB2 | Monongahela silt loam, 3 to 8 percent slopes, moderately eroded |
| MoC2 | Monongahela silt loam, 8 to 15 percent slopes, moderately eroded |
| NoA | Nolo silt loam, 0 to 3 percent slopes |
| NoB | Nolo silt loam, 3 to 8 percent slopes |
| Ph | Philo silt loam |
| Pm | Pope fine sandy loam |
| Po | Pope silt loam |
| PuA | Purdy silt loam, 0 to 5 percent slopes |
| RcE | Ramsey and Dekalb channery sandy loams, 35 to 70 percent slopes |
| RdF | Ramsey and Dekalb very stony sandy loams, 35 to 100 percent slopes |
| So | Stony land, sloping |
| Sp | Stony land, steep |
| Sr | Strip mine spoil, sloping |
| St | Strip mine spoil, steep |
| TrA | Tygart silt loam, 0 to 3 percent slopes |
| TrB2 | Tygart silt loam, 3 to 8 percent slopes, moderately eroded |
| UgB2 | Upshur–Gilpin silty clay loams, 3 to 8 percent slopes, moderately eroded |
| UgC2 | Upshur–Gilpin silty clay loams, 8 to 15 percent slopes, moderately eroded |
| UgC3 | Upshur–Gilpin silty clay loams, 8 to 15 percent slopes, severely eroded |
| UgD2 | Upshur–Gilpin silty clay loams, 15 to 25 percent slopes, moderately eroded |
| UgD3 | Upshur–Gilpin silty clay loams, 15 to 25 percent slopes, severely eroded |
| UgE3 | Upshur–Gilpin silty clay loams, 25 to 45 percent slopes, severely eroded |
| VaB2 | Vandergrift silt loam, 3 to 8 percent slopes, moderately eroded |
| VaC2 | Vandergrift silt loam, 8 to 15 percent slopes, moderately eroded |
| WgB3 | Weikert–Gilpin shaly silt loams, 5 to 12 percent slopes, severely eroded |
| WgC3 | Weikert–Gilpin shaly silt loams, 12 to 20 percent slopes, severely eroded |
| WkD2 | Weikert and Gilpin shaly silt loams, 20 to 35 percent slopes, moderately eroded |
| WkD3 | Weikert and Gilpin shaly silt loams, 20 to 35 percent slopes, severely eroded |
| WkF2 | Weikert and Gilpin shaly silt loams, 35 to 100 percent slopes, moderately eroded |
| WkF3 | Weikert and Gilpin shaly silt loams, 35 to 100 percent slopes, severely eroded |
| WmB2 | Westmoreland silt loam, 5 to 12 percent slopes, moderately eroded |
| WmC2 | Westmoreland silt loam, 12 to 20 percent slopes, moderately eroded |
| WmD3 | Westmoreland silt loam, 20 to 35 percent slopes, severely eroded |
| WrA | Wharton silt loam, 0 to 3 percent slopes |
| WrB2 | Wharton silt loam, 3 to 8 percent slopes, moderately eroded |
| WrC2 | Wharton silt loam, 8 to 15 percent slopes, moderately eroded |
| WrC3 | Wharton silt loam, 8 to 15 percent slopes, severely eroded |
| WrD2 | Wharton silt loam, 15 to 25 percent slopes, moderately eroded |

Soil map constructed 1966 by Cartographic Division, Soil Conservation Service, USDA, from 1957 aerial photographs. Controlled mosaic based on Pennsylvania plane coordinate system, south zone, Lambert conformal conic projection, 1927 North American datum.

# INDIANA COUNTY, PENNSYLVANIA
# CONVENTIONAL SIGNS

## WORKS AND STRUCTURES

Highways and roads
- Dual
- Good motor
- Poor motor
- Trail

Highway markers
- National Interstate
- U. S.
- State or county

Railroads
- Single track
- Multiple track
- Abandoned

Bridges and crossings
- Road
- Trail, foot
- Railroad
- Ferry — FY
- Ford
- Grade
- R. R. over
- R. R. under
- Tunnel

Buildings
- School
- Church

Forest fire or lookout station

Mines and Quarries

Mine tunnel opening

Pits, gravel or other

Power line

Pipeline

Cemetery

Dams

Levee

Tanks

Well, oil or gas

## BOUNDARIES

- National or state
- County
- Township or range, U. S.
- Reservation
- Land grant
- Small park, cemetery, airport

## DRAINAGE

Streams
- Perennial
- Intermittent, unclassified

Canals and ditches — CANAL, DITCH

Lakes and ponds
- Perennial
- Intermittent

Wells, water — flowing

Springs

Marsh

Wet spot

Alluvial fan

Drainage end

## RELIEF

Escarpments
- Bedrock
- Other

Prominent peak

Depressions (Large, Small)
- Crossable with tillage implements
- Not crossable with tillage implements
- Contains water most of the time

## SOIL SURVEY DATA

- Soil boundary and symbol — Dx
- Gravel
- Stones
- Rock outcrops
- Chert fragments
- Clay spot
- Sand spot
- Gumbo or scabby spot
- Made land
- Severely eroded spot
- Blowout, wind erosion
- Gully
- Slip, earthen